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In Memoriam

DR. THURSTON SCOTT WELTON, obstetrician and gynecologist, died on March 15, 1961 after a brief illness. He was seventy-five years of age. Dr. Welton served as Editor of THE AMERICAN JOURNAL OF SURGERY, a publication of The Reuben H. Donnelley Corporation, from 1928 until January 1958, at which time he became Editor Emeritus. As Editor of the Journal he was responsible for the publication of many "firsts" in surgery and accepted the first Honor Award for Distinguished Service in Medical Journalism given by The American Medical Writers' Association in 1953. Dr. Welton contributed many articles to the medical literature and is the author of several books.

He received his medical degree from the Long Island College of Medicine in Brooklyn, New York in 1908. As an intern, he was interested in surgery, obstetrics and gynecology and later specialized in obstetrics and gynecology. In 1917, he became attending gynecologist and obstetrician to the Williamsburgh Hospital and, in 1920, to the Greenpoint Hospital in Brooklyn.

He became attending gynecologist and obstetrician at the Long Island College Hospital in 1925. In 1927, he was made Clinical Professor of Obstetrics at Long Island Hospital and, in 1934, Professor of Clinical Obstetrics and Gynecology. He was consulting obstetrician and gynecologist at the Long Island College Hospital and the Greenpoint Hospital, consulting obstetrician at the Mary Immaculate Hospital in Jamaica and consulting gynecologist at the Southside Hospital in Bayshore. In 1950, he became Professor Emeritus of Clinical Obstetrics and Gynecology at the State University of New York College of Medicine, formerly the Long Island College of Medicine.

Dr Welton served as President of the Brooklyn Medical Society, President of the Brooklyn Gynecological Society and President of the Medical Society of the County of Kings. He was a member of the American Medical Association, a Fellow of the American College of Surgeons (1918) and a Founding Member of the American Board of Obstetrics and Gynecology (1930). He was a Fellow of the American Association of Obstetricians and Gynecologists and Abdominal Surgeons. He is included in "Who's Who in America."

At the Long Island College Hospital's 101st birthday party, he was honored by the following words: "His friends will remember him as one of the few great wits, raconteurs and after-dinner speakers in medicine, who brought laughter and good cheer to many an otherwise dull function!"

Dr. Welton is survived by his widow, Marjorie Roberts Welton, a daughter, Jane Keet, and three grandchildren.

EDITORIAL

A Problem for Surgeons

THE teaching of surgery should not be obstructed by the medical profession as a whole. In a majority of instances it is not now possible in a moral, ethical and legal manner to teach and to make available experience in the essentials of specific, surgical, operative procedures. Those engaged in other fields of medicine can teach more adequately with the aid of semi-private and private patients; they do not have the stumbling block of the definitive "surgical procedure." This, then, is a problem for surgeons.

The reasons for the nationwide marked decrease in the number of available ward-service patients for teaching are known to all. Health insurance or health plan coverage of the people of the United States is rapidly approaching the 100 per cent mark. In 1959—the last year for which complete figures are available, 91 per cent of the population of New York State had hospital coverage and 83 per cent had surgical, professional fee coverage. Nationwide, the respective figures are 73 per cent and 66 per cent. Many highly industrialized small communities throughout the country have even higher percentages of coverage than does the State of New York. All evidence points to a continued increase in coverage.

In most institutions, a patient with hospitalization and professional fee coverage is either encouraged to be, or told that he must be, a semi-private or private patient. This, of course, has had the effect of gradually reducing the number of ward-service patients. Semi-private patients should not be utilized for resident experience in the technical aspects of surgical operations because of the implied and, therefore, legal patient-physician relationship, indicating that the physician personally will take care of the patient, at least as far as the most essential parts of patient care are concerned. The most technical part of the operation is certainly one of the most essential parts of patient care.

There are three possible solutions to this present serious problem of the teaching of surgery.

The first possible solution is that someone will come up with an entirely new workable idea. This possibility is unlikely, for during some twenty years of discussions, many of which were heated, none of the many County Medical Societies has developed a possible practical solution which is known to those of us who, for many years, have been most seriously interested in the problem.

The second possible solution is that the private physician alone has the legal, moral and ethical right to choose one of his interns or residents to perform the technical, essential part of an operation on one of his (the attending physician's) semi-private or private patients without the expressed consent or knowledge of the patient. In the light of many previous discussions, this will probably not be acceptable to either the medical profession or the public.

The third possible solution is to permit some patients with some type of hospital and professional fee coverage (after having been informed of their rights, legal privileges and financial ability) to choose to be admitted as a ward-service, teaching patient, to be cared for primarily by residents-in-training under adequate, direct and, when justified, indirect supervision of more senior attending surgeons. This, to the best of my knowledge, is the only practical, workable solution that has ever been suggested. It should be immediately obvious to all that most patients with health insurance or health plan coverage will not elect to be ward-service, teaching patients. However, past experiences indicate that some patients will choose to be ward-service patients.

It should also be recognized that some patients with minimal hospital and professional fee coverage still cannot afford to be semi-private patients.

In the past twenty years, while the nation's health insurance coverage has increased from 8 to 73 per cent in the nation, 91 per cent in New York State, and higher in some smaller communities, the medical profession has failed to adjust completely to the socioeconomic change. Its failure to do so has penalized surgical training, specifically the teaching of surgical operative technics. The medical profession has constantly and repeatedly failed to make a decision on this problem, presumably because of one ugly question, that is, "Who gets the money from the professional fee coverage?"

With the anticipated 26 per cent increase in population between 1958 and 1970, it hardly seems possible that allowing some semi-private patients to choose to be treated as ward-service patients would decrease the number of patients the average practicing physician would be called upon to treat. This becomes even more obvious in view of the fact that it seems almost impossible for each existing medical school to enlarge considerably, and to build fourteen to twenty new medical schools before 1970. Such expansions and additions were suggested to the Department of Health, Education and Welfare in 1958 in the Bayne-Jones report by a committee of practicing physicians. These suggestions were made in an attempt to maintain an adequate physician: patient ratio in the exploding population.

It is suggested that professional fees collected from ward-service, teaching patients be managed not by the hospital, but by the professional staff of the hospital, or by the professional staffs of the particular professional services or departments of the hospital. Conceivably, all of it could go to junior and senior attending staff members to compensate them for their efforts in behalf of the teaching program of the hospital. Other possible uses would be to: (1) pay expenses of out-of-town speakers, (2) pay travel expenses of residents to state and national scientific meetings, and (3) buy surgical equipment which could not be purchased by the hospital. Disbursement of the monies would be for whatever the professional staff believed was the greatest need of the educational program.

The need of every hospital to support its medical educational program is great. This is so regardless of whether or not the hospital is affiliated with a medical school. According to a recent article in *New York Medicine*, the costs of *only* room, board and stipends for interns in seven New York hospitals increased an average of 350 per cent between 1948 and 1959. In the individual hospitals, these increases varied from 232 to 667 per cent. At the same time, the average increase in the number of interns was 6 per cent. The average increase in these costs for residents was 325 per cent. These costs of room, board and stipend are only a portion of the costs of a good medical educational program. It should also be pointed out here that the complexities of medicine today are such that residency training will not revert to the less expensive and older method of training under a single person—a preceptor.

The failure of the medical profession to solve this serious, internal medical problem, which has been obvious and becoming more serious for twenty years, can only reduce the effectiveness of our national societies in the presentation of their viewpoints in regard to other current and pressing problems of national interest.

I do not believe the public, our patients or the Federal Government will allow the medical profession to bring about, by its failure to take definite, practical action, an inferior type of training of its surgeons.

It is the duty of everyone who performs surgical operations and is associated with interns, residents and preceptees or assistants to convince his colleagues in other fields of medicine that a very serious problem now exists, and that a practical decision should be made soon. The medical profession must make practical and timely decisions or the control of medicine, by default, will be assumed by others.

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SCIENTIFIC PAPERS

Evaluation of Therapy in Burns by Morbidity Studies

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THE care of the burned patient is complex, with relatively slow progress being made in improving therapy. To some extent, this is due to a lack of adequate methods for evaluating the treatment of burns. In the past this evaluation has been attempted largely on the basis of the conclusions drawn from mortality studies. This study suggests that an analysis of the morbidity in patients with burns could provide further criteria for evaluating the effectiveness of treatment.

In selecting the group for this study, all patients who were treated for burns at the University of Michigan Hospital between January 1946 and July 1959 were considered. A total of 943 patients were treated. However, 486 of these had minor injuries which required only outpatient care. In twenty-five cases treatment was primarily reconstructive. There were sixty-five deaths in the group. These classifications were omitted from the study. For the purpose of studying morbidity factors, the remaining 367 patients who were hospitalized for the care of acute burns were considered the most appropriate and constitute the study group. It includes those patients who were admitted immediately after injury and those whose admission to the University Hospital was delayed while treatment was started elsewhere. Relatively few patients were found to have burns greater than 40 per cent. Consequently, the data derived from these can only be considered suggestive, not statistically significant.

There are many factors involved in the morbidity of burned patients. The type and number of complications, the differences in anatomic areas burned, the type and spacing of operations, and other factors, are recognized as important but are beyond the scope of this report. The following items have been analyzed for this presentation: (1) age; (2) the per cent skin area burned (calculated by the Berkow method); (3) per cent of full thickness burn (determined by reviewing the operative notes—only those areas which required grafts were considered as having full thickness loss); (4) the number of hospital days during the first admission including those patients admitted immediately after trauma and those admitted after initial treatment elsewhere; (5) the number of operations; and (6) the number of readmissions required for reconstructive work.

The per cent of skin area burned is an important factor in mortality studies and is also significant in evaluating morbidity in terms of length of hospitalization. Patients with burns of 1 to 9 per cent required fifty-four days of hospitalization while the patients who survived with the largest burned areas (60 to 69 per cent) required an average of 165 days. This is illustrated in Figure 1.

The total per cent of burned areas has been used as a basis of calculation in previous studies evaluating therapy. The implication is made that both the partial thickness and full thickness areas of skin loss are equally important. This is not the case; the per cent of full thickness skin loss is the significant criterion in a morbidity study. Our experience demonstrates that a total burn involving 50 per cent of the body surface including 10 per cent of full thickness loss does not take much more time to correct

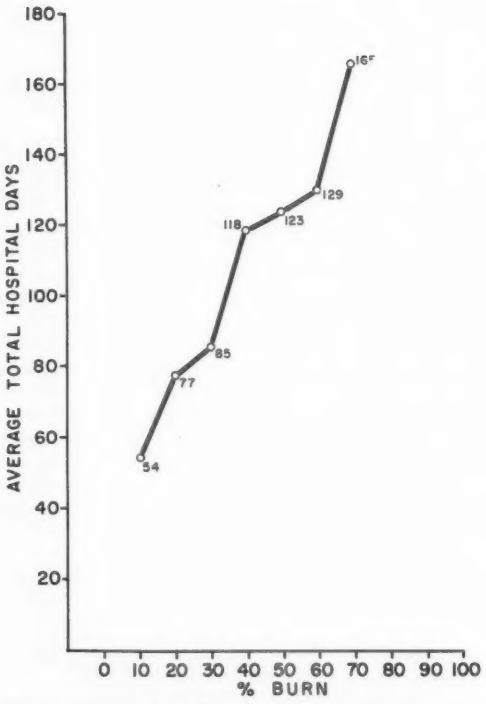

FIG. 1. The number of hospital days required for the treatment of burns is shown. The total percentage of burned skin is illustrated.

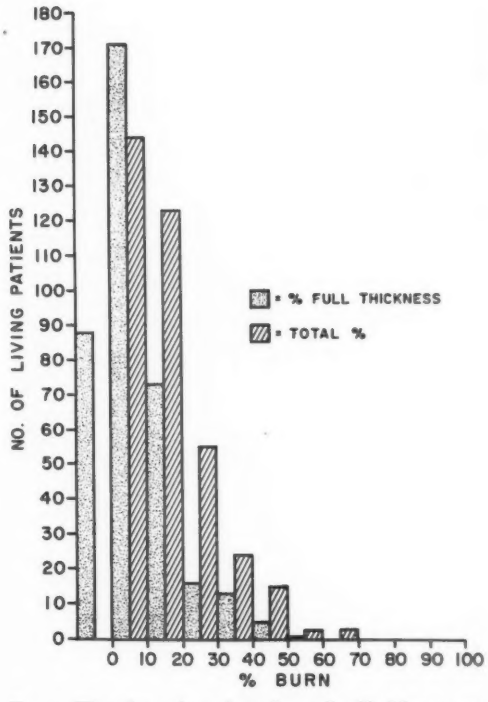

FIG. 2. The 367 patients have been classified by extent of burn. Both the total area burned and the percentage of full thickness burn are illustrated for the same group.

than a total burn of 10 per cent that is all full thickness. Figure 2 shows the change in distribution that occurs when we measure the full thickness loss separately from the total burn area. Eighty-eight patients were estimated to have full thickness burns at the time of admission involving 1 to 51 per cent of the body surface with an average of 12 per cent. Further examination revealed that these were primarily burns of partial thickness requiring no skin grafts.

The length of hospitalization of patients compared on the basis of total percentage of skin area burned to its full thickness is shown in Figure 3. A full thickness burn of a given size required a considerably greater length of hospitalization than a burn of equal size that was not all full thickness. The eighty-eight patients who were found to have no full thickness burns required an average of fifteen days hospitalization. The 142 patients whose total burns covered 1 to 9 per cent of skin area required fifty-four days of hospitalization, while 170 patients who had full thickness burns of 1 to 9 per cent required seventy-five days, or three weeks longer. The hospital days required to treat a patient, in which the area of full thickness burn only is considered, is three to eight weeks longer than when the total burn of an equal area is taken into account.

A division of the 367 cases into age groups showed that there were 239 patients between zero and nineteen years; eighty-eight patients in the twenty to forty age group, and forty patients in the fifty to eighty-nine year old category. In Table 1 the per cent of full thickness burn and the age of the patient are classified by length of hospital stay. It is interesting to note that while age is a significant factor in mortality studies, it has little effect on the relationship between the per cent of full thickness burn and the length of hospitalization.

Two other factors may be considered in discussing length of hospitalization. The first is the effect of late vs. early hospital admission. In Figure 4 the difference is illustrated in the

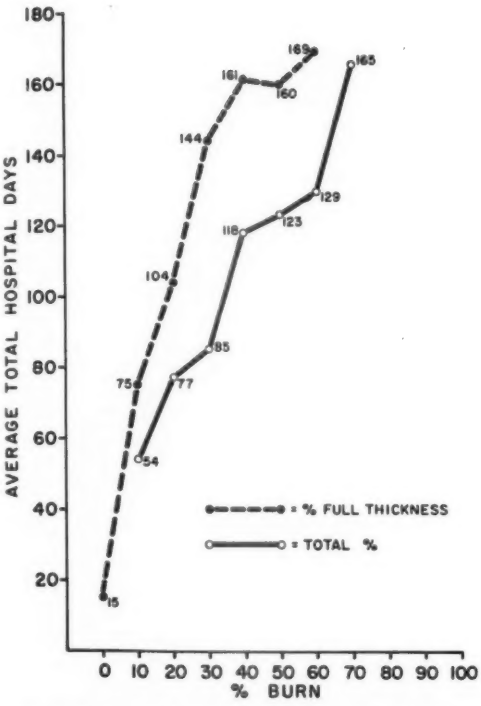

FIG. 3. The length of hospitalization of patients is compared on the basis of total percentage of skin area burned and percentage of skin burned to its full thickness.

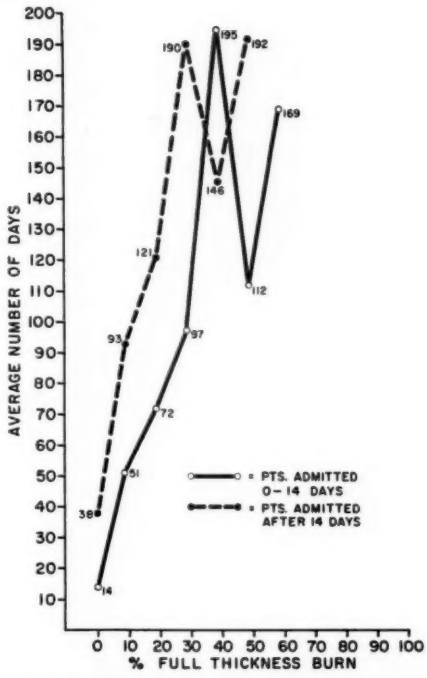

FIG. 4. In this comparison of total hospitalization the 367 patients are separated into two groups. The first consisted of those admitted within the first two weeks following the burn, and the second consisted of those admitted after the fourteenth day.

total length of hospitalization between those patients who were treated elsewhere before admission to the University of Michigan Medical Center, and those who were admitted immediately after injury. It was found that patients with late admission spent a greater total number of days in the hospital, roughly equivalent to the length of outside treatment. It should be noted that referrals of patients with burns are made from hospitals which are not adequately equipped to care for this injury. In considering the number of days required to correct the defect after the patient was admitted to the University Hospital, it was found that the time was approximately the same for the patient who arrived within fourteen days after the burn had occurred as for the patient who arrived later. For example, the patient who sustained a 20 per cent full thickness burn and arrived at the University of Michigan Medical Center within the first fourteen days required approximately sixty-four days of hospitalization. This is shown in Figure 5. The patient admitted fourteen days or more

TABLE I

THE RELATIONSHIP OF AGE TO NUMBER OF HOSPITAL DAYS AND PER CENT OF FULL THICKNESS BURNS INVOLVED

Age	Per cent Full Thickness Burn						
	0	1–9	10–19	20–29	30–39	40–49	50–59
0–9	16	71	98	137	158	208	169
10–19	11	95	110	146	183	104	...
20–29	13	73	121	80	166	88	...
30–39	17	78	105	167	125	190	...
40–49	13	73	102	122	...	...	...
50–59	17	67	106	350	191	...	...
60–69	28	72	103	...	...	...	...
70–79	9	132	72	...	...	...	...
80–89	...	36	...	26	...	...	...
Average hospital days	15	75	104	144	161	160	169

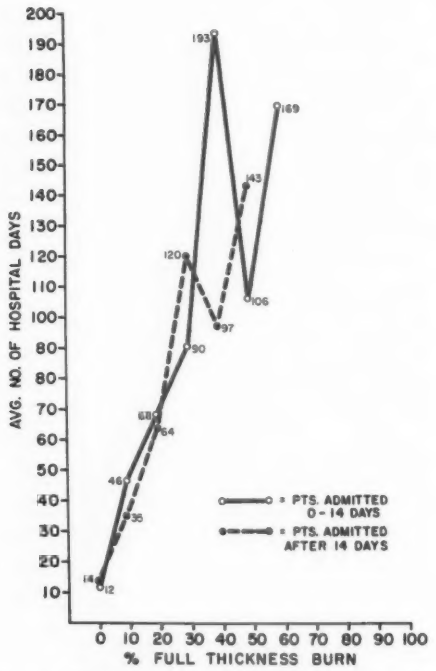

FIG. 5. A comparison is made between early and late admissions at the University of Michigan Medical Center to demonstrate the number of days required to treat burns of equal magnitude after admission.

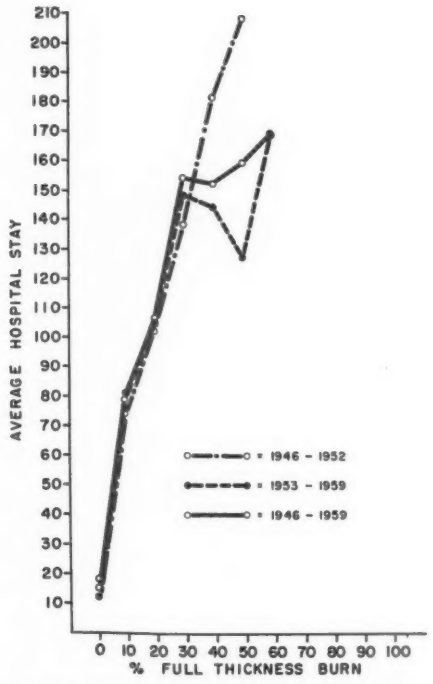

FIG. 6. The length of hospital stay for the period between 1946 to 1952 is compared to the period 1953 to 1959. The average hospitalization for the entire period is also shown.

following his injury required sixty-seven days of hospitalization. Thus it would seem that the therapy given prior to admission had no appreciable affect, either positive or negative, on the length of hospitalization at the University Hospital. The same relationship is found for all burns up to 30 per cent.

The second consideration is the comparison of the burns treated between 1946 to 1952 and those treated from 1953 to 1959. As seen in Figure 6, there was little difference in the total hospitalization for patients who sustained full thickness burns. This would seem to indicate that there has been little significant change in effectiveness of therapy in thirteen years.

The number of operative procedures required to correct a defect of a given size is another factor to consider in evaluating therapy. As shown in Figure 7, an average of two operations were necessary to cover areas of full thickness loss between 1 and 9 per cent and four were required in the 10 to 19 per cent group. The average number of procedures required to correct full thickness skin loss covering 50 to 59 per cent of the body increased to fourteen.

The criteria to evaluate therapy suggested so far are related to factors found within the first admission. Many patients require repeated hospitalizations for operative correction of both functional and cosmetic deformities. The total number of admissions necessary to rehabilitate a patient who has sustained a given area of full thickness burn is, therefore, another factor that can be used for evaluating therapy. As illustrated in Figure 8, burns in which full thickness loss was less than 1 per cent required one admission. As the area of full thickness loss increased, the number of admissions increased so that the group of patients with burns of 40 to 49 per cent averaged four admissions.

COMMENTS

Although the primary purpose of this report is the consideration of criteria for evaluating

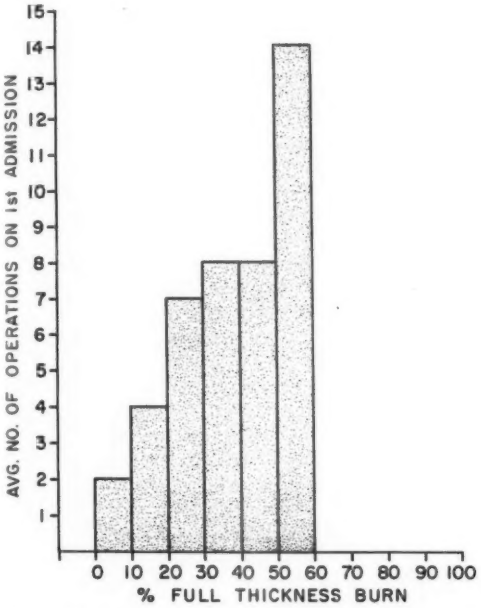

FIG. 7. The average number of operations required on first admissions to correct full thickness burns are illustrated.

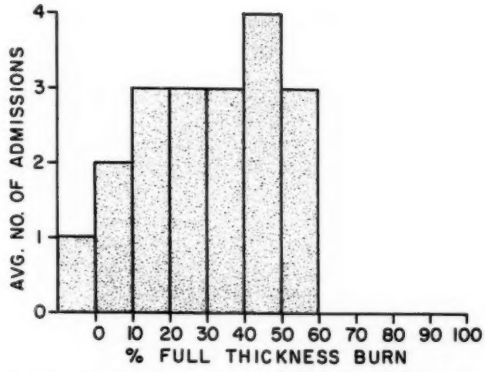

FIG. 8. The average number of admissions required to correct burns of different sizes are demonstrated.

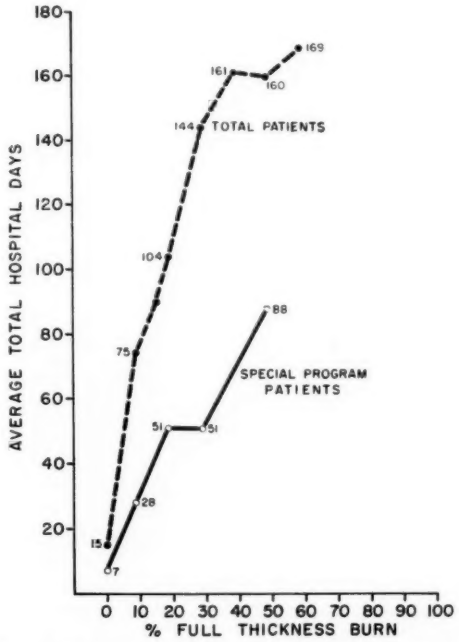

FIG. 9. A comparison of total hospital days of all patients vs. those treated by a specific burn program illustrate that the organization of patient care, giving careful attention to the prevention and treatment of complications and employing an aggressive approach to the operative repair, resulted in the marked decrease in hospitalization required to correct burns of a given magnitude.

therapy for burned patients, certain factors reported deserve further comment. The average number of days required to correct the areas of full thickness loss is high. The evidence that the length of hospitalization of a burned patient remained as high during the period of 1953 to 1959 as it was in the period between 1946 to 1952 implies that basic surgical knowledge is not being applied in the treatment of burns. A clinical trial of vigorous therapy was instituted to determine the fewest number of days in which given areas of skin loss in full thickness burns could be corrected. It was found in this preliminary attempt, that the number of hospital days could be reduced to approximately one-half that utilized for the patients in the study. As demonstrated in Figure 9, this was accomplished by organization of patient care, by giving careful attention to the prevention and treatment of complications and employing an aggressive approach to the operative repair. If these results can be repeated in further clinical trials, the decrease in the suffering of the patient and his economic loss would be considerable.

SUMMARY

1. Morbidity factors are suggested to serve as criteria in evaluating therapy for patients

with burns. These include length of hospitalization as affected by extent of full thickness burn, number of operations required to correct full thickness burns of a given magnitude, and total number of admissions required to correct full thickness burns.

2. It is necessary to determine the depth and extent of skin destruction in each case to be able to employ these criteria.

3. Although the over-all combined hospitalization is increased for late admissions, the time required to correct given areas of full thickness loss at the University of Michigan is approximately the same for both early and late admissions.

4. A comparison of length of hospitalization between the 1946 to 1952 period and the 1953 to 1959 period of this study revealed no significant change.

5. There is a relationship between the area of skin burned to its full thickness and hospitalization, but not between the age and hospitalization.

6. Both the average number of operations and average number of readmissions required in treatment of full thickness burns are reported.

Acknowledgments. This investigation was supported by U. S. Public Health Service research grant RG–5913, from the Division of General Medical Sciences, Public Health Service. I wish to express my appreciation to Dolores Shupenka, M.P.H. for the preparation of the statistical material.

Treatment of Severe Electric Injuries

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DESPITE the safeguards that have been developed to minimize the potential hazard of the electric current, there has been a continuous increase in fatalities and burns due to electricity since the first fatal accident from a dynamic electric current in 1879 [1]. According to Lewis [2], 965 fatalities from contact burns occurred in 1954. However, deep electric burns still are rare. At the Mount Vernon Center for Plastic Surgery (England), which receives severely burned patients from a population of 5,000,000, only two or three patients with electric burns are seen yearly [3].

A live electric wire may be touched with safety so long as the contact does not complete the electric circuit and result in flow of electric current through the tissues. An electric injury occurs only when some part of the body is interposed between two conductors, completing the electric circuit.

The heat resulting from an electric current passing through the body is similar to that produced by current passing through any conductor. As in other conductors, the current seeks the path of least resistance such as blood vessels and cerebrospinal fluid. In an electric burn the tissue may be heated by the current to 2,500°C. or more, nearing the arc temperature of an electric arc welder. Tissues in the vicinity of this arc are intensely coagulated. The points of entrance and exit of the current are particularly significant because they receive the concentrated effect of the current.

TYPE OF CURRENT

Electric current of 1,000 volts or less is considered to be low tension current, and more than 1,000 volts is high tension current. Despite widespread contrary opinions, currents of 110 volts may prove fatal. Jellinek [4] found that currents as low as 25 volts are dangerous when the body is well grounded. Contact with a high tension wire with a wet hand and the body grounded may be more dangerous than contact with a dry, calloused hand.

High tension wires usually carry alternating current of high voltage and amperage. The electric current stimulates strong muscular contractions, frequently necessitating forcible detachment of the victim from contact with the wire. In other circumstances the strong muscular contractions may catapult the victim away from the wire, thus breaking the electric circuit. If the victim is still touching the charged wire, the rescuer may take due precautions for himself before detaching the wire from the victim's contact; he may do so by using a nonconductor such as wood or rubber.

Alternating current is about three times more dangerous than direct current. The electric impulses produced by the alternations throw the muscles into tetanic spasm, cause the victim to grip the electrodes more firmly, and increase the difficulty of detachment. This, in turn, increases the danger, which is proportionate to the duration of the flow of current through the victim.

As the number of cycles increases, the danger decreases, muscles and nerves being less sensitive to high frequencies. High frequency currents in the region of 1,000,000 candle power are used in therapeutic diathermy. Alternating currents between 40 and 150 candle power are the most dangerous. Sixty-cycle alternating current, commonly available for domestic and industrial use, is particularly disturbing to the respiratory center and heart. In the absence of extensive burns, deaths from high voltage accidents are usually due to injury to the respiratory center.

AMOUNT OF CURRENT

The amount or intensity of an electric current in a circuit is dependent on the tension of the

current flowing (voltage) and the resistance of the conductor through which the current flows. Amperage, the measure of the intensity of electric current, equals the tension (voltage) divided by the resistance of the conductor. This is expressed by the following equation:

$$\text{current (amperes)} = \frac{\text{voltage}}{\text{resistance (ohms)}}.$$

Although the voltage in electric accidents may be known or can be determined, the quantity of current, or amperage, usually cannot be estimated accurately because of the variable resistance of different body tissues and variable conditions of electric contact. Only in experiments with animals or in legal human electrocutions can the intensity (amperage) of the current be determined accurately. If the resistance is less than 1,200 ohms, current of 110 volts may be fatal, since the intensity of current amounts to about 90 ma. [5]. With favorable contacts between the skin and external conductors, the resistance of the human body may be reduced to less than 1,000 ohms. Accidental electrocutions in bathtubs and fatal electrocutions of sweating workmen who contact conductors of 110 volts fall in this category.

CONDUCTION OF ELECTRIC CURRENT THROUGH VARIOUS TISSUES

Skin is highly resistant to an electric current at the points of both entrance and exit. This opposition of skin to conduction varies according to its thickness, moisture, cleanliness and vascularity. Other variable factors include humidity of the air; size, shape and nature of the electrodes; and area and firmness of contact [2]. In many accidents the current leaves via the ground, so the type of footwear is important. Skin resistance varies from person to person and from one area of the body to another. Thin skin is less resistant than thick skin. Subcutaneous fat forms a large part of the so-called skin resistance. The thick skin of the palmar surface of the hand is more resistant than the thin skin of the dorsum. The hard, calloused palm of a laborer may have a resistance of 1,000,000 ohms. Sweating may decrease the resistance from 30,000 to 2,500 ohms. Small superficial injuries such as scratches, small cuts and abrasions lower the skin's resistance [6].

After an electric current has penetrated the skin, it passes rapidly through the body along lines of least resistance, that is, through the tissue fluids and along blood vessels, leading to degeneration of vessel walls and formation of thrombi. This vascular injury often occurs at some distance from the site of entry and accounts for the apparent progressive nature of the lesion. A limb may appear viable soon after an electric accident, but in a few days it becomes ischemic and finally gangrenous. Bone is the only tissue with a greater resistance than skin. However, bone lesions are frequent in electric injuries when the current enters through the skull. The large surface of the skull and the vascular diploë decrease its resistance and allow a damaging amount of current to flow through it.

When a patient is not fatally electrocuted, the results of an electric current passing through the body may be divided into immediate and delayed effects.

IMMEDIATE EFFECTS OF AN ELECTRIC INJURY

Since the electric current spreads rapidly from the point of entrance and is not collected again until it reaches the point of exit, the greatest density of an electric field is found near the areas of entrance and exit. Gray or yellow depressed areas of full-thickness loss of skin will be apparent at these sites. The lesion is bloodless, cold and painless. The edges of the slight depression are erythematous or charred. These areas of full-thickness burn, the so-called current markings, are usually round, oblique or linear, corresponding to the shape of the electrodes. Multiple punctate burns are often seen on the soles of the feet, corresponding to the sites of the nails in a victim's shoes.

In passing through the body electric energy is transformed to heat, which is most concentrated at the point where the current passes through the skin. Heat alters the structures along the pathway of the current (current markings). The current markings on the skin are best seen in low voltage accidents; in high voltage cases free sparking will superimpose thermal burns on the electric burn. Furthermore, in high tension accidents, extensive charring may be present which obscures the current markings.

The sites of entrance and exit of the current (current markings) are initially noninflammatory and remain dry and uninfected for about a week. After that period, infection becomes a problem and mitigates against the

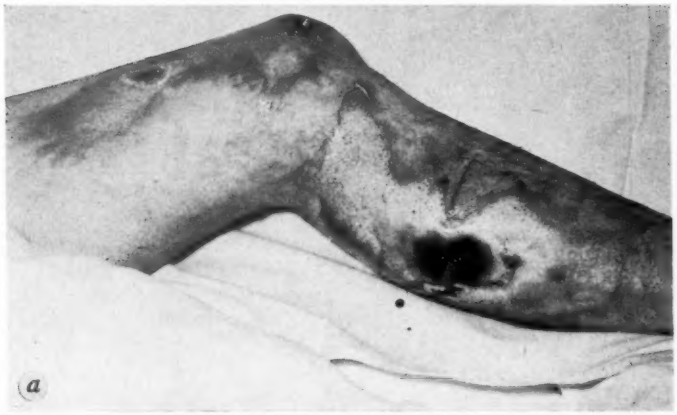

FIG. 1. Case 10. A, extensive high tension electric burn involving the left thigh and calf.

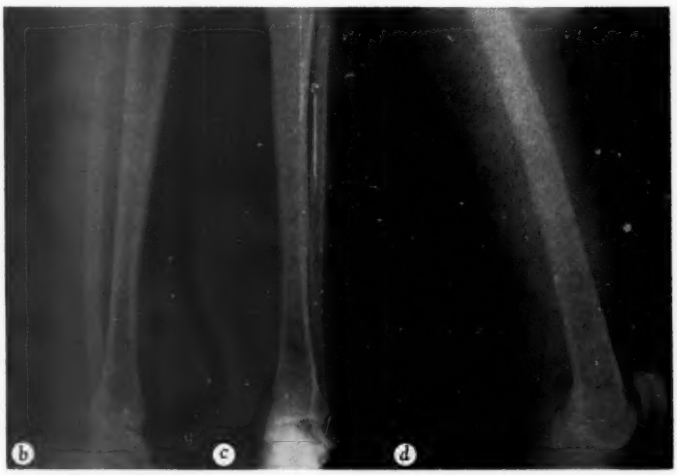

FIG. 1. B, C and D, left leg on day of injury. Note the subcutaneous gas below the burned areas, caused by the intense heat in the soft tissues.

survival of a graft [7]. Skin which initially appeared uninvolved may become necrotic. Necrosis is often progressive and much greater than that expected from the appearance of the original lesion.

The electric burn forms a homogenous block of coagulation necrosis, with a groove extending deeply into muscle and even to bone. The extreme temperatures occurring in the subcutaneous tissues may result in the sudden formation of steam in the tissues (Fig. 1), which if it "explodes" through the peripheral skin, may leave a current marking resembling a bullet hole.

In Figure 2 which shows a section of skin taken from a man who was accidentally electrocuted by high tension current, the distribution of nuclei of the epidermal cells following the direction of the current should be noted.

Other immediate effects of an electric injury are tetanic contractures of the musculatures, unconsciousness due to involvement of the central nervous system and occasionally, ventricular fibrillation. Fibrillation is set up easily by low voltages, especially by alternating current of 40 to 150 candle power. It is well to emphasize the fact that rarely is there any significant permanent damage to the central

FIG. 2. Skin taken from a man accidentally electrocuted. Note the distribution of the epidermal cell nuclei following the direction of current. Note the homogenization of the connective tissue of the cutis. (Hematoxylin and eosin stain; original magnification × 165.)

nervous system or peripheral nerves after an electric injury.

DELAYED EFFECTS OF ELECTRIC INJURIES

Delayed effects of electric injuries are largely due to injuries to blood vessels in which there is degeneration of the vessel wall and formation of thrombi. Because of these pathologic developments, necrosis of tissue tends to progress beyond the apparent limits of the externally visible wound. Part or all of an extremity may become necrotic and gangrenous a few days after electric injury. Sequestra may develop due to interference with the vascular supply to a bone. Another delayed effect of an electric burn especially about the head is the development of cataracts; such changes may be unilateral or bilateral and may be stationary or progressive. In electric cataracts the point of electric contact usually, although not always, is near the involved eye.

ELECTRIC INJURIES SEEN AT THE MAYO CLINIC

From January 1945 through January 1959, thirty-four patients with serious electric injuries were seen at the Mayo Clinic. Twenty-four of these were thought to be due to high tension electricity; as would be expected, all occurred in men, the majority of them being linemen or electricians. Six burns were of the mouth due to low tension current from domestic electric cords. These accidents occurred in children who had placed a live electric cord or socket in their mouths. Three serious burns of the legs arose from defective surgical diathermy electrodes.

In this study thermal burns from hot electric elements were excluded. Only those electric injuries of contact that produced full-thickness defects and required free-skin grafts or pedicle flaps for repair or that presented a cosmetic problem were included.

TREATMENT

The most important emergency treatment in electric injuries is artificial respiration. Jellinek [4] emphasized that the lives of many people might be saved after acute electric shock if prolonged artificial respiration were administered. Cardiac massage may be useful if started early, that is, within five minutes after the shock. If artificial respiration is still required after hospitalization, it can be continued with one of the available respirators. Shock, although present, is usually less severe than with thermal burns.

In the literature there are divergent opinions regarding the optimal time for definitive care of an electric burn. In view of the difficulties encountered in accurately delineating the true extent of the burn initially, the majority of authors advised waiting and allowing the lesion to demarcate before attempting reconstructive measures [2,8–10]. However, other authors stated that in their experience, they were able to determine the extent of the burn initially and therefore could excise the burned area without delay.

In high tension burns a varying amount of circulatory embarrassment often develops early due to thrombosis of vessels. In thrombosis of larger vessels, one must wait for spontaneous demarcation of the gangrenous portions. Even when thrombosis is absent, necrosis of tissue may extend for a considerable distance under the intact skin.

Scalp and Cranium. Six of our patients had electric injuries of the scalp and cranium (Cases 1, 3, 8, 9, 21 and 22). In three cases burned areas on the scalp were the only injuries on the body worthy of mention, the so-called exit burns being inconsequential. In the other three cases significant burns occurred on the upper or lower extremities or both. In all six patients the underlying cranium was involved. Three patients had involvement of the outer table only, and three had involvement of the whole thickness of the cranium. (Figs. 3A and

FIG. 3. Case 21. A, high tension electric burn of the scalp resulting in a full-thickness scalp and cranial defect. B, treatment by sequestrectomy and closure of the defect with rotation of scalp flaps. Free-skin graft applied to the flap donor defect on the scalp. (From: Figi, F. A. and Struthers, A. M. The treatment of scalp deformities. In: Transactions of the International Society of Plastic Surgeons, First Congress, pp. 339–346. Baltimore, 1957. Williams & Wilkins Co.)

B.) During the formation of the full-thickness sequestrum, epidural abscesses developed in two of the latter three patients; these abscesses were evacuated five weeks and five months after injury, respectively.

In those patients in whom only the outer table of the skull was involved, sequestrectomy and closure of the cranial defect by advancement of rotation scalp flaps were used. In one patient the wound was closed by a split-thickness skin graft, and subsequently had more permanent coverage by means of a local scalp flap.

Orbital Region. One patient had a severe electric burn involving the left zygomatic arch and orbital regions. (Fig. 4.) The left ocular globe was completely destroyed. Removal of the zygomatic sequestrum and enucleation of the left globe were performed. At a later date excision of a lacrimal fistula and of a scar about the region was performed with coverage by a free skin graft. The patient refused further reconstructive operation.

Central Nervous System. One patient (Case 8) complained of occasional episodes of "dizziness" and "blacking out" and had trouble with coordination of the right arm. By way of contrast, another man (Case 1) was unconscious in the hospital for six weeks after his injury. In neither case did neurologic symptoms or deficit follow reconstructive surgical measures.

Mouth and Lips. At the clinic electric burns of the mouth and lips were allowed to heal spontaneously, after which secondary plastic repair was employed to correct residual deformities. (Fig. 5.) No early primary excisions were performed. In regard to low tension electric burns about the mouth, we are of the opinion that primary excision of the lesion

FIG. 4. Case 15. One month old, high tension electric burn of the left zygomatic and orbital region.

FIG. 5. Case 28. A, extensive burn of lips and mouth from electric socket. B, small amount of residual deformity followed spontaneous healing of the electric burn.

probably would result in the loss of some normal tissue and that such loss would be detrimental to the final repair of the defect. We believe, as do most authors, that better results can be obtained by allowing the oral burn to heal spontaneously, after which the resultant deformity can be repaired secondarily.

Hands and Upper Extremities. In eighteen cases the hands and upper extremities were involved by significant burns, all of which were thought to be caused by high voltage accidents. In four instances digits had been amputated, and in two, arms had been amputated prior to the patients' admission to the clinic. After admission four patients underwent amputation of an arm (or arms) and six patients had digits removed.

Coverage of an open wound, particularly about the hands, should be accomplished without undue delay to prevent infection in the wound and minimize subsequent cicatrization. Split-skin grafts may be used for early coverage of the wound. As would be expected, the severest injuries usually occur on the flexor surface of the hand. Although initial coverage with split-skin grafts will close the wound, subsequent contractures on the flexor surface may necessitate the replacement of the scarred and contracted graft with a blood-carrying pedicle flap. In this series of high voltage burns of the hand, the anterior surface of the abdomen was the donor site usually selected for a pedicle flap. Small burns that could be repaired by a cross-finger or thenar flap were not encountered. Because the extensor surface of the hand and wrist is rarely as severely involved as the flexor surface and because contractures rarely form over convex surfaces, satisfactory coverage of the extensor surface of the hand usually can be obtained by the use of a split-skin graft.

If the burns of the hand are deep and have destroyed nerves, tendons or bone, no reconstruction of the framework or moving mechanism of the hand should be attempted until adequate soft-tissue coverage is obtained. With deep burns of the hand after initial closure of the wound, the first step in successful reconstruction is the application of a pedicle flap of skin. Repair of tendons or nerves is doomed to failure if performed in a bed of scar tissue. There is no hope for successful reconstruction until adequate skin and subcutaneous tissue cover the defect. Z-plasties on the flexor surface of the antecubital fossa may be useful for treatment of scar contractures. The use of a local flap to cover a localized burn in the antecubital fossa and minimize a subsequent flexion contracture is illustrated in Figures 6A, B and C.

Trunk and Axilla. In burns about the trunk and axilla, the lack of vital structures immediately below the surface of the skin allows for several simple methods of repair. In selected cases primary excision of burned tissues and immediate closure of the wound by suturing

FIG. 6. Case 24. A, extensive high tension electric burn of right hand, arm, antecubital fossa and axilla. B, appearance of right arm and hand two weeks later. C, result following amputation of the forearm and repair of the antecubital fossa burn with a local flap. Free-skin graft was applied to the flap donor defect. D, electric burn of right foot and ankle present on patient's admission. E, electric burn of left foot and ankle present on admission. F, appearance of both legs and feet two weeks later. Legs and feet dressed until demarcation of the extent of the loss has occurred.

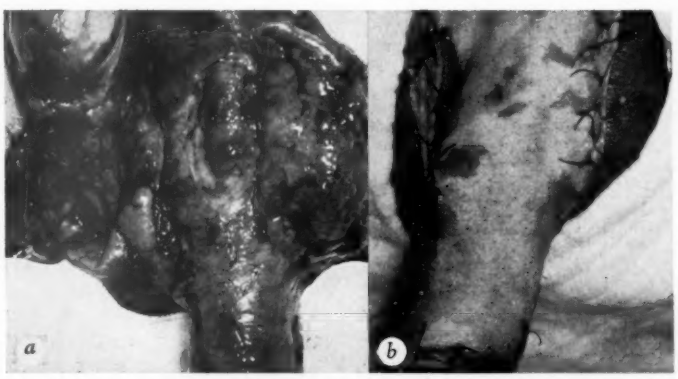

FIG. 7. Case 8. A, defect resulting from an extensive electric burn of the penis, scrotum and left inguinal region. Left orchiectomy required. B, repair two weeks later using free-skin grafts.

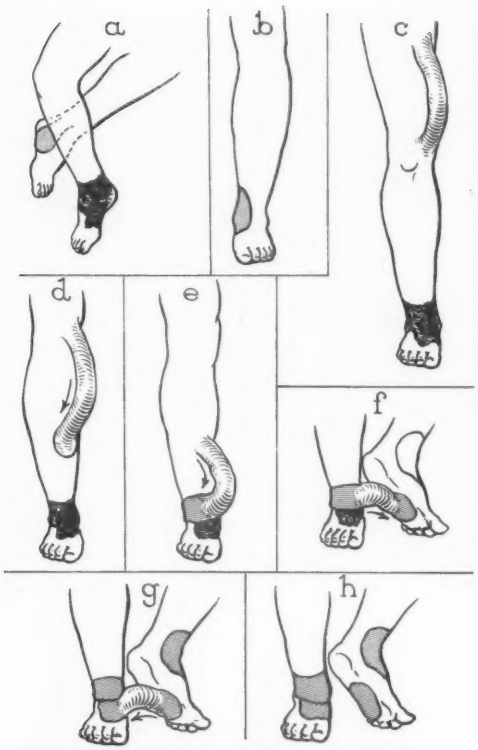

FIG. 8. The raw areas on the feet and ankles were covered initially with free-skin grafts. Because of the depth of the burns and the instability of the free-skin grafts over bone, pedicle-flap coverage of the grafted areas on the feet was employed. Use of a cross-leg flap followed by a tube-pedicle flap to achieve permanent pedicle coverage of extensive burn defects of both feet and ankles is shown.

or application of a split-skin graft may be possible.

Genitalia. One of our patients had extensive high tension burns involving the penis and left inguinal and scrotal regions. The necrotic left testicle required removal. After drainage of a complicating inguinal abscess, the debrided region was covered with a split-skin graft. Satisfactory closure was obtained. (Figs. 7A and B.)

Lower Extremities. Fourteen patients had significant electric burns involving the legs or feet or both. Amputation of the lower part of the leg was required in three patients and amputation of toes was required in two. The lesions on the fleshy part of the lower leg and thigh usually were closed by excision

FIG. 9. Case 33. Amputation specimen from a patient with a severe burn resulting from a defective negative electrode in surgical diathermy.

and either primary suture or skin graft. On the feet and about the ankles, the close proximity of the tendons and bone made reconstruction more complex. In some instances burns on the foot were sufficiently shallow that free-skin grafts provided satisfactory permanent coverage. In other instances free-skin grafts applied over bony prominences or over weight-bearing areas were not strong enough to withstand normal everyday use. In these cases pedicle coverage from the opposite calf (cross-leg flap) was usually employed. Figures 6D, E and F and Figure 8 show severe foot burns and their reconstruction. Extensive gas gangrene developed in the legs in two patients (Cases 5 and 7) and required amputation.

Burns from Surgical Diathermy Electrodes. The legs of three patients had been burned by defective electrodes in surgical diathermy. The extensive loss of tissue that can result from these burns is illustrated in Figure 9 (Cases 32, 33 and 34). A plea must be made for the negative electrode of units used in surgical diathermy to be placed over a fleshy portion of the patient's leg, preferably the lateral part of the thigh or the posterior surface of the calf.

Burns resulting from diathermy electrodes placed over more vital areas present serious and possibly irreparable reconstructive problems.

SUMMARY

From January 1945 through January 1959, thirty-four patients with acute electric burns or deformities from old electric injuries were treated at the Mayo Clinic. Most of the patients had had treatment elsewhere prior to coming to the clinic. This series does not include minor electric burns or thermal burns from hot electric elements.

A study of these thirty-four cases has led us to conclude that early excision of the burned region has little if any application in the high-tension type of burn because vascular damage and tissue necrosis exist beyond the apparent limits of the burn. In these cases it seems preferable to wait until a definite line of demarcation between viable and nonviable tissue is evident. Even burns about the lips from electric cords are better left alone until healed, after which plastic repair of residual deformities can be undertaken; often these minor burns about the mouth will heal so satisfactorily that little, if any, subsequent plastic work is required.

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Additional Uses of Aluminum Foil in the Treatment of Burns

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THE use of metallic foils in the care of wounds is not a new practice, however, it offers several advantages that need re-emphasis. Joseph Lister [*1*] first described the use of tin foil and of sheet lead, material then used as lining for tea chests, as primary wound dressings. In 1867, he stated the following. "If a perfectly healthy granulating sore be well washed and covered with a plate of clean metal, such as block tin, fitting its surface pretty accurately, and overlapping the skin an inch or so in every direction, and retained in position by adhesive plaster and a bandage, it will be found, on removing it after twenty-four or forty-eight hours, that little or nothing that can be called pus is present, merely a little transparent fluid, while at the same time there is an entire absence of the unpleasant odour invariably perceived when water dressing is changed. Here the clean metallic surface presenting no recesses, like those of porous lint, for the septic germs to develop in, the fluid exuding from the surface of the granulations has flowed away undecomposed, and the result is absence of suppuration. Further, it shows that the mere contact of a foreign body does not of itself stimulate granulations to suppurate; whereas the presence of decomposing organic matter does." Since that time many other metallic foils have been used as dressing materials, including gold and silver leaf [*2*], silver foil [*3*], tantalum foil and more recently aluminum foil [*2,4,5*]. Previous authors [*2,4,5*] have described the use of various foils as dressings for burns as well as dressings for grafts and split skin donor sites [*3,5*].

The purpose of this paper is to report some additional ways aluminum foil may be used in the management of the burned patient. This

FIG. 1. A sheet of sterile aluminum foil is used to protect the patient from adherence to cloth surfaces and allows the burned patient to be transported about the hospital in relative comfort on a hospital cart. The metal hoops prevent the sterile cover sheet from touching the burn surfaces.

FIG. 2. The anesthetic induction and surgical preparation are carried out on the cart covered with sterile foil prior to moving the patient to the sterile foil surface of the operating table.

foil was found to fulfill all the requirements of a material with a smooth homogeneous surface that was nonirritating and nonadherent to either burned or granulating surfaces. In addition, it is relatively cheap, readily available, easily sterilized and may be used repeatedly.

Aluminum foil is used routinely on all carts used for the transportation of the severely burned undressed patient, such as from the tub area to the dressing room (Fig. 1), or from the tub to the operating room. (Fig. 2.) The fact that burned patients are able to lie comfortably on this material led to its use in the "open" treatment of the circumferentially burned patient on the Stryker frame. (Fig. 3.) Not only are these patients undergoing open treatment more comfortable on the foil, but also they can be turned and have their positions changed fairly painlessly with virtually no blood loss.

Another important property of aluminum foil is its impermeability. For this reason it has been used routinely on the operating table as a means of accurately estimating the blood losses from the debridement of burns and from split graft donor sites. (Fig. 4.) (The donor site is

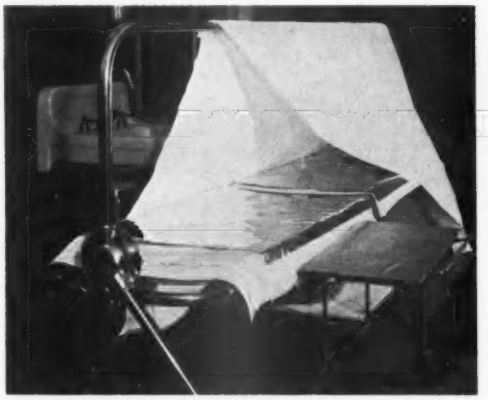

FIG. 3. Sterilized commercially available aluminum foil used as an atraumatic, nonadherent cover over a sterile draped Stryker frame.

FIG. 4. The patient is placed on a foil-covered operating table so that blood lost during the procedure can be accurately measured in a graduated cylinder. Adherence to cloth covers of operating tables with additional blood loss and possible through and through contamination of the wound are prevented.

allowed to clot spontaneously, without the application of various hot or cold compresses, and therefore some blood drips onto the table before the clotting mechanism is effective.) At the completion of the operative procedure the foil is removed and the blood thereon is easily measured in a graduate. Foil is then replaced under the patient to serve as a clean nonadherent surface upon which the patient is laid while the burn dressing is being applied. Using aluminum foil on the operating table has the additional advantage of lessening operating blood loss secondary to the adherence of granulation tissue to the usual cotton table covers.

Heavily perforated narrow strips of aluminum foil are being tried as the innermost layer of the donor site dressing as a possible solution to the problem of the usual painfully adherent cloth products now in use. The chronically adherent donor site dressing is often suspected as being a factor in the establishment of infection of the donor areas; the easily removable foil should remedy this situation. Such a perforated material could be used on any open granulating wound in which dressing adherence and subsequent interference with epithelial proliferation is a problem, such as seen in the management of exfoliative dermatitis, extensive abrasions and other similar situations.

SUMMARY

Some uses of aluminum foil in the care of the burned patient have been presented. In addition to its use as a dressing over granulating wounds, aluminum foil placed beneath the patient has several advantages. It prevents adherence to bedding and lessens blood and serum loss when the open method of treatment is used. Furthermore, transportation of the burned patient to the operating room while lying on this material is less painful. The use of aluminum foil to cover the operating table decreases loss of fluid from the wounds and allows more accurate measurement of blood loss with surgical debridement or grafting procedures.

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Postoperative Treatment of the Gynecologic Patient

USE OF PHENYLBUTAZONE

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THE SUCCESS or failure of an operative procedure depends, to a great degree, upon the postoperative course of the patient. In all surgical cases, including gynecologic operations on patients who have abdominal or perineal wounds, the local discomfort has been postulated in the past as being due partly to the inflammatory reaction as a result of operative trauma [5]. It seems logical, therefore, that if some type of treatment could be directed toward the alleviation of edema, cellular infiltration and the promotion of healing, the postoperative course could be accelerated.

After Miller [10] and Kremer [9] in 1957 and 1958 were able to demonstrate by experiments with animals that the reaction to inflammation in patients with infection and those with diseases which required surgery was not necessarily a favorable one, the idea of using anti-inflammatory drugs as additional treatment clinically was considered. Though the various factors associated with inflammation are not wholly understood, the increase in capillary permeability, fibrous plugging venules and lymphatics which resulted in edema seemed to be accountable for the lack of response to antibiotic agents. Under these circumstances, there was constant devitalization of surface tissue elements which provided further media for growth of bacteria as well as inhibited an adequate response to antibiotic therapy.

In order to counterbalance the effects of the deleterious actions associated with inflammation, several anti-inflammatory agents were tried. Connell and Rousselot [4,5] clinically applied the treatments which had proved efficient for patients with a variety of surgical lesions. A favorable reaction was obtained with streptokinase, trypsin, cortisone, Hydrocortone® and phenylbutazone. Of this group, phenylbutazone was found to be the most effective. It also produced less serious side effects than any of the other drugs used.

Recently, there appeared in Switzerland a compound which consisted of analgesic drugs plus a preparation of 15 per cent phenylbutazone sodium for use in the treatment of arthritis. It soon became apparent that phenylbutazone itself or 3,5-dihydroxy-1,2-diphenyl-4-*n*-butylpyrazolidine [12] had significant pharmacologic properties of its own [7]. The pure compound known as Butazolidin® [7] was then used extensively in the treatment for rheumatoid arthritis. Its similarity, in action, to cortisone was soon noticed and because of its comparatively low cost it was rapidly accepted as a therapeutic substitute. Oral administration of the drug resulted in peak plasma levels within two hours when constant doses were given daily. Plasma levels reached a plateau in three to four days and there they remained relatively constant. On average dosage, the metabolic rate was about 20 per cent daily. A period of seven to ten days was required to eliminate the drug which can be recovered as a metabolite in the urine. This latter fact becomes important when it is learned that one of the metabolic products has been recovered and used with effectiveness, largely in the manner of the parent drug [3,5,7]. The parahydroxy metabolite or oxyphenbutazone* has therapeutic value in the ratio of 3:2 to the original compound with less degree of side reaction [6–8].

* Product of Geigy Pharmaceutical Company.

While phenylbutazone was used chiefly in the treatment for rheumatoid arthritis, it also has antipyretic and antiphlogistic properties. The preparation fell into disrepute because of the reported toxic effects upon the central nervous system, gastrointestinal tract and the hemopoietic elements. However, in recent years a more judicious usage of the drug has resulted in minimization of these side effects. It is still contraindicated in patients suffering from marked edema, those who have cardiac disease or decompensation, hypertension, renal and hepatic diseases or those with a history of peptic ulcer or drug allergy.

The satisfactory anti-inflammatory action of phenylbutazone was not stressed until Stein and Rose [*11*] were able to report its effectiveness in the treatment of superficial thrombophlebitis. Because of this successful result, Archambault and Archambault [*1*] reasoned that the same benefit might be repeated in patients suffering from hemorrhoids in the acute phase. The drug brought relief from pain and edema in 95 per cent of over 400 patients studied. There was no appreciable lytic action upon the thrombi and they had to be removed surgically. Connell and Rousselot [*5*], distressed by the lack of response to antibiotic therapy in their patients with infections, burns and diseases requiring surgery, used phenylbutazone and obtained the same type of gratifying analgesic and anti-inflammatory action. Encouraged by these reports, we believed that there would be similarly dramatic results in a series of operative gynecologic patients. Of particular interest were those who had perineal wounds since their discomfort seems more pronounced than those with abdominal incisions.

MATERIAL

This is a report of forty-five patients who had gynecologic operations and who were treated with phenylbutazone in their postoperative period. (Table 1.)

The drug was administered to all patients in this survey in the following manner: On the night prior to operation, 400 mg. was given. In the postoperative period, the medication was started again as soon as nausea from the anesthetic agents had ceased. In the first three day period, the dosage was 200 mg. phenylbutazone three times daily, with meals. On the following four days, 200 mg. was given twice daily, with meals. No patient received more than the maximum dose of 3,400 mg. If the hospital stay was under seven days, the dose was considerably less. All narcotic preparations were withheld unless specifically needed, and then were ordered in individual doses rather than as a routine. The salt intake was restricted because of the known salt and water retention properties of the drug itself. Each patient was watched carefully for skin eruption, edema, nausea and vomiting or the signs and symptoms of peptic ulcer. The treatment was appraised from the standpoint of relief from pain without narcosis, local inflammatory reaction, the type and degree of side reaction and the changes upon the hematologic system.

TABLE 1

THE USE OF PHENYLBUTAZONE IN POSTOPERATIVE TREATMENT OF GYNECOLOGIC PATIENTS

Type of Patient	No. of Patients	No. of Side Effects	Results			
			Excellent	Good	Fair	Poor
Bartholin cyst...	3	0	3	0	0	0
Cesarean section	8	0	7	0	0	1
Complete hysterectomy....	22	1*	21	1	0	0
Marchetti.....	2	0	2	0	0	0
Hysterotomy...	1	0	1	0	0	0
Cornual resection.....	2	1†	1	1	0	0
Vaginal hysterectomy.....	7	0	6	0	1	0
Total.....	45	2	41	2	1	1

* Nausea.
† Papular eruption.

In view of the reported toxicity of phenylbutazone, we were skeptical at first of its use [*1*]. However, after extensive investigation it soon became apparent that the drug is comparatively safe if it is used in small doses over a short period of time [*1,4*]. There were toxic results only when therapy was prolonged and medication was given in large quantities. Consequently, we adhered to the same dosage schedule as advocated by recent workers, and limited administration of the drug to hospitalized patients. Excluded from this study were those who had evidence of hypertension, renal, cardiac or hepatic disease, previous drug allergies or a history of peptic ulcer.

The relativeness of pain suffered by any given person is difficult to determine since there is a wide margin of variance. In order to evaluate

properly such a subjective phenomenon, a system had to be evolved to arrive at significant conclusions. In our daily visit to the patients, two factors had to be determined: (1) the degree and severity of the patient's complaints in reference to her operation in general; and (2) the degree of discomfort occasioned by her surgical incision. By painstaking and searching consideration of her answers to our questions and by careful observation of the alerted house and nursing staffs, it was possible to derive an idea of what was a favorable or unfavorable response to treatment. The patients themselves were unaware of any special treatment. The results were classified in the following four categories: (1) The term *excellent* indicated a favorable response to the questions as well as a satisfactory report from the hospital staff. The need for narcotic preparations was restricted to three doses. There was no evidence of inflammatory reaction about the wound, and the temperature and pulse were within normal limits. (2) The term *good* designated those patients who required more narcotic preparations than the first group but, on the whole, were quite comfortable. They also received a satisfactory report from the hospital staff. The patients had no inflammation in the wounds and only moderate fever which persisted for two to three days. (3) *Fair* was used to classify those patients who had severe pain, which necessitated repeated doses of narcotics over a long part of their hospital stay. They were given an unfavorable report from the hospital personnel. Their wounds revealed no evidence of inflammatory reaction. (4) The *poor* results described those patients who had no relief from pain, complained constantly and needed continuous narcotic therapy. Also they may or may not have had evidence of wound inflammation.

In addition to the interrogation, a daily inspection of abdominal or perineal wounds was carried out. All of the forty-five patients had no inflammatory reaction, the incisions being clean without evidence of wound infiltration or erythema. Antibiotic therapy was used for three patients who had temperature elevations on days other than the first postoperative day. Although the causative factors could not be determined, the patients responded readily to antibiotics. Blood pressure and pulse were checked at regular intervals and no aberration was detected. In order to determine whether or not the anti-inflammatory drug had a deleterious effect on the leukocytes, a count and differential were taken on the fourth postoperative day. All of these counts were found to be within normal limits and none demonstrated leukopenia or granulocytosis. The side reactions were minimal. Generally the patients felt well and had no unusual complaints. One patient had nausea, another had a mild papular eruption, but none had edema, signs of cardiac, renal or hepatic damage. A review of the accompanying table reveals that forty-one of the forty-five patients had an *excellent* result, two received a *good* report and there was one each in the *fair* and *poor* classifications.

The anti-inflammatory properties of phenylbutazone have been used to advantage not only in the surgical gynecologic cases but also they have proved beneficial in the treatment of pelvic inflammatory diseases. The potentialities in the latter are great; and in those cases in which the drug was used the results have been extremely encouraging. The analgesic properties of the drug have been effective in the treatment of dysmenorrhea [2] as well. The continued application of phenylbutazone in these conditions is being explored further.

COMMENTS

The rationale of the use of phenylbutazone as an anti-inflammatory drug seems logical. This appears to be substantiated since the medication is known to relieve pain, edema and erythema which are three of the prime signs and symptoms of an inflammatory reaction. The drug has proved to be beneficial in the treatment of superficial thrombophlebitis and other surgical inflammatory diseases such as burns, cellulitis, abscess formation and hemorrhoids. Despite the limited number of patients studied here, the favorable results obtained would encourage the continued usage of this medication in the postoperative care of obstetric-gynecologic patients. It is understood that there are factors other than inflammation which produce discomfort or morbidity in the postoperative gynecologic patient. No one drug can be proposed as a panacea for all postoperative complications. There is no substitute for meticulous attention to detail particularly in the postoperative care of the gastrointestinal tract, urinary system or the replacement of body fluids and proper electrolytic balance. The anti-inflammatory drugs serve as one of the

valuable assistants in the postoperative care of the surgical patient just as antibiotic therapy, enterokenetic agents and early ambulation make their contributions to the total picture of complete postoperative recovery.

SUMMARY

1. The reaction to inflammation in patients with diseases which required surgery, burns and infections is questioned as a favorable phenomenon.

2. A study of forty-five gynecologic operative procedures in which phenylbutazone was used as an anti-inflammatory drug in the postoperative period is evaluated.

3. When used over a short period of time, phenylbutazone is completely safe. There was no evidence of local inflammation in the surgical wounds and no edema or erythema.

4. Of the forty-five patients studied, forty-three had either *excellent* or *good* results.

5. The use of anti-inflammatory drugs has proved to be a valuable contribution in the postoperative care of the gynecologic patient.

Acknowledgment: The author wishes to express his gratitude to Dr. M. William Amster, Assistant Medical Director of the Geigy Pharmaceutical Company, for his cooperation and help in the preparation of this manuscript.

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A Clinical Evaluation of Oxyphenbutazone in Surgical Inflammatory Lesions

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OUR numerous experiences with topical enzymes during the past decade demonstrated their ability to reduce or inhibit inflammation of wounds. This phenomena was accompanied by a reduction in wound pain and edema, and unimpaired wound healing. An elaborate evaluation was carried on comparing the efficacy of the steroids, proteolytic enzymes and certain chemical compounds [1]. The most efficient and nontoxic agent to date is the compound oxyphenbutazone* [2]. In this report we will discuss the therapeutic results obtained with this anti-inflammatory agent in 245 surgical patients. This project was carried out on the surgical wards of the St. Vincent's Hospital in the City of New York.

MATERIALS AND METHODS

Oxyphenbutazone is a white powder soluble in the alkaline environment of the duodenum; it is prepared as an enteric-coated tablet. The material is recovered in the urine shortly after administration and up until twenty-four to seventy-two hours after cessation of therapy in the resting patient.

This characteristic is considered in our regimen for prophylactic as well as short-term and periodic therapy. It permits the interruption of therapy for short periods of time without loss of effective control of the inflammatory reaction.

The dosage requirements of oxyphenbutazone for effective control of acute and chronic inflammation, as well as for reduction of the inflammatory reaction expected from injury to tissue, are determined as follows: (1) the extent and duration of the lesion, (2) the patient's weight, and (3) anticipated trauma to tissue.

Large extensive lesions, such as cellulitis, carbuncles, phlebitis and massive injury, required a higher priming and maintenance dose than less severe conditions. However, the duration of therapy was usually limited from three to five days. Chronic lesions required a lower priming and maintenance dose, but either longer or periodic courses of therapy. In adults weighing up to 175 pounds, the priming dose was 300 mg. followed by 100 to 200 mg. every six to eight hours. Heavier patients required a priming dose from 400 to 600 mg. followed by 200 mg. every six to eight hours. Children were given a priming dose of 50 to 200 mg. followed by 50 to 100 mg. every eight hours.

In the preoperative group the initial dose is 400 mg. given at 6 P.M. on the eve of surgery, followed by 200 mg. in six hours. Medication was started again as soon as the patient could tolerate oral ingestion, with 200 mg. every six hours for seventy-two hours. In a few instances in which oral therapy was contraindicated for a number of days following surgery, phenylbutazone or trypsin was given parenterally.

In all patients in whom the inflammatory process is associated with infection, it is imperative that an appropriate antibiotic be given concomitantly with oxyphenbutazone. If this precaution is not heeded, *the invasion and the rapid spread of wound organisms will be observed.*

In this study, serial observations were made of blood count, urine, liver and renal chemistries in many patients. No abnormalities were noted. Further, the drug was administered to patients with a known history of peptic ulcer, with no untoward effects.

* Supplied as Tandearil,® courtesy of Geigy Pharmacal Co.

The patients with surgical lesions treated with oxyphenbutazone in this study may be broadly grouped as follows: Group A, contusions, sprains, lacerations, post-traumatic arthritis and fractures; group B, acute infectious processes; group C, thermal burns; and group D, pre- and postsurgical prophylaxis.

RESULTS

Group A. Forty patients with severe contusions and sprains were studied; all had a marked response. (Table 1.) The pattern of response obtained is ascribed to all lesions successfully reacting to the agent. Within sixteen to twenty hours following the initiation of therapy, all patients noted a relaxation of tension at the site of injury. This was accompanied by a decrease in edema, redness and pain. Within twenty-four to thirty hours, many patients were free of pain and capable of functional activity. However, if the soft tissue injury was complicated by a ruptured ligament or a small fracture, attempts at function resulted in recurrence of pain and swelling.

In five patients with lacerations who received oxyphenbutazone for a period of four days following injury, two had severed tendons of the wrist. The tendons were sutured, the wound closed and a cast applied. Healing was prompt and uncomplicated by swelling or pain. Two days prior to the removal of the cast, therapy with oxyphenbutazone was started again and continued for five days. The observations made by those in charge of rehabilitation noted the softness and flexibility of the wounds and the rapid return of function.

We selected fifteen patients with severe post-traumatic arthritis. These patients were characterized by (1) all having had a serious injury involving one or more joints, (2) repetitive bouts of acute inflammation in these joints produced by either overexertion or barometric changes in the weather, and (3) a gradual change in the contiguous bony surfaces. The patients responded to therapy in twenty-four to forty-eight hours with loss of pain and an increase in mobility. Once the symptoms were alleviated and therapy discontinued, the patients were free of pain until either the joint was subjected to overexertion or barometric weather changes ensued. As these patients have become sensitized to the early recurrence of their symptoms, intermittant therapy was prescribed. The patients were instructed to reinstitute therapy with 300 mg. of oxyphenbutazone at the first sign of discomfiture and to follow this with 100 mg. every twelve hours for twenty-four to thirty-six hours. This regimen proved to be extremely helpful to these patients.

In six patients who had had simple fractures of the extremities, therapy was instituted on admission and continued for five days. In all patients, there was demonstrable decrease in wound edema within three to four days as the supporting casts became quite loose. Pain reduction was questionable as there was increased discomfiture to the unstable limb as the edema rapidly decreased. Ecchymoses was still present on the fourth or fifth day when a second cast was applied. Healing time was unchanged. Oxyphenbutazone therapy was started again just prior to the start of rehabilitation. In all instances less dependent edema was noted and functional progress was rapid.

The eleven patients with miscellaneous conditions included: nontraumatic arthritis, myositis, bursitis and tendinitis. The over-all individual series was too small for detailed analyses but the results were promising, except in one patient with rheumatoid arthritis.

Group B. We have studied sixty-one patients with inflammation concomitant with infection. (Table 1.) These patients had the following lesions: cellulitis, abscesses, phlebitis, stasis ulcers of legs, infected burns and wound infections. All wounds were cultured and the organism sensitivity to antibiotics determined. Supportive therapy, such as blood transfusion, surgical drainage, wet saline soaks or enzyme débridement, elevation and, in some instances, immobilization, was provided. Oral or parenteral antibiotics were given simultaneously with the initiation of oxyphenbutazone therapy. In the few patients with acute localized infections, in whom drainage was established and circulation efficient, two effects were immediately noted. (1) The pain, swelling and peripheral redness disappeared in eighteen to twenty-four hours following the start of combined therapy. (2) There was a marked decrease in the bacterial count during this period of time.

Oxyphenbutazone alone was given to two patients with cervical carbuncles. In both, a marked invasive spread was noted about the periphery of the wound. A similar response was noted in a patient with an infected abdominal wound who was supposedly receiving oral anti-

TABLE 1
RESPONSE TO OXYPHENBUTAZONE

Lesions	Number of Patients and Response				
	Total	Complete	Marked	Slight	None or Worse
Group A					
Musculoskeletal disorders (average length of therapy, three days)					
(a) Contusions, lacerations, sprains	40	33	7	...	...
(b) Traumatic arthritis	15	10	5	...	...
(c) Fractures	6	5	1	...	...
(d) Other	11	8	2	...	1
Total	72	56	15	0	1
Per cent	...	77.8	20.8	0.0	1.4
Group B					
Infections (average length of therapy, three days)					
(a) Cellulitis, abscess	26	17	6	2	1
(b) Phlebitis	9	7	...	1	1
(c) Respiratory infections	14	11	3	...	...
(d) Other	12	7	5	...	...
Total	61	42	14	3	2
Per cent	...	68.8	23.0	4.9	3.3
Group C					
Thermal burn wounds, (second and third degree) (average length of therapy, five days)					
Stage one: shock, swelling	12	...	...	...	12
Stage two: preliminary to skin grafting	12	...	7	5	...
Stage three: functional rehabilitation	12	9	3	...	...
Group D					
Postoperative pain relief (average length of therapy, three days)					
(a) Hemorrhoidectomy	17	15	2	...	...
(b) Herniorraphy	17	12	4	...	1
(c) Abdominal surgery	24	14	7	2	1
(d) Laryngeal surgery	6	3	3	...	...
(e) Skin graft (donor)	1	1	...	...	...
(f) Other	35	20	14	1	...
Total	100	65	30	3	2
Per cent	...	65.0	30.0	3.0	2.0
Patients requiring narcotics					
(a) Full dose	9	...	...	...	...
(b) Reduced amount or none used	30	...	...	...	...
(c) None specified	61	...	...	...	...
Total	100	...	...	...	...

biotics. Within twenty-four hours, wound inflammation had progressed peripherally for almost 2 to 3 inches. It thus must be stated again, that when *inflammation is associated with infection*, an appropriate antibiotic must accompany oxyphenbutazone therapy.

Group C. Twelve patients with thermal burns were studied. (Table 1.) These lesions consisted of second degree, deep second degree and third degree burns. Three courses of therapy were attempted. In the first stage of the burn injury oxyphenbutazone was administered for four days to ascertain the effect of the agent on the subcutaneous edema and pain. The drug at the levels used, i.e., 400 mg. to start, followed by 100 mg. every six hours, did not clinically inhibit or decrease the usual burn edema. The patients, in all instances, required substantial narcotic relief of pain.

A second course of oxyphenbutazone with antibiotic therapy was given for three days during the second phase or period preceding skin grafting. Laboratory cultures indicated that patients so treated had cleaner wound surfaces than patients in a larger group treated with germicidal or saline soaks.

A third course was employed for five to ten days during the third phase or rehabilitation period. In this capacity, a marked reduction in the usual daily edema following exercise was noted. Pain and edema were considerably less, and rehabilitation time was reduced.

Patients with burns require further studies with the initial employment of higher doses during the first five days to ascertain whether the subcutaneous edema may be decreased or the patients extravascular fluid mobilized earlier. The inhibition and control of keloid reaction are now under study.

Group D. In a further challenge of the inflammatory reaction to trauma we have given oxyphenbutazone to 100 patients before and after elective surgical procedures. (Table 1.) The criteria of response consisted of (1) postoperative wound healing; (2) wound edema and erythema; (3) early functional return; and (4) postoperative narcotic requirements.

The patient received a priming dose of 400 mg. approximately sixteen hours before surgery. This was followed with 200 mg. every six hours until surgery. Following surgery, the patient was given 100 mg. as soon as he could tolerate fluid. This was followed with a similar 100 mg. dose every eight hours for three days. If the oral route was unavailable for a prolonged period of time, phenylbutazone or trypsin was given parenterally every eight hours.

For this study surgical procedures usually associated with postoperative discomfiture, as well as a number of surgeons with varying technics and skill, were selected. To further clarify the evaluation, a double blind study was instituted.

If any patient requested medication for relief of pain postoperatively, he was given 100 mg. of Demerol.® Our results demonstrated no instance of dehiscence or breakdown. Wound healing without erythema or edema was noted throughout the medicated group. Keloid formation was not observed, although our study contained a number of Negroid and Mediterranean types. The usual semi-flexed position taken by the patient after hernia or vertical abdominal incisions were absent. However, coughing would elicit pain in the area of the wound.

In 65 per cent, there were no requests for narcotics after surgery. In 30 per cent, patients requested only one injection of Demerol, usually after a reaction from anesthesia. Five per cent of the patients, required the usual 4.5 mg. postoperative injection of Demerol. In the control group, approximately 40 per cent had wound edema and erythema about the suture lines. No dehiscences were noted, but one patient had a frank wound infection even though he was a "clean" and uncontaminated case and on an antibiotic regimen.

In truth, a number of the control patients on whom skillful, atraumatic surgery was performed, required only one or at most two postoperative injections of Demerol. However, the results were significant and illustrate that a great deal of the postoperative wound discomfiture is due to the inflammatory reaction following trauma.

TOXICITY

In these 245 patients, toxic manifestations to oxyphenbutazone were carefully searched for with multiple complete blood counts and urinalysis, liver and renal chemistry surveys. In only three patients were slight gastric reactions noted shortly after ingestion of the tablets.

COMMENTS

We are impressed with the rapid, sustained, anti-inflammatory effects of oxyphenbutazone

in this wide variety of minor and major surgical inflammatory lesions. This agent, acting specifically on the tissue elements in the wound area, has no other observed systemic effects. The results of therapy allow rapid rehabilitation of the patient and an early return of function of the injured area.

SUMMARY

Oxyphenbutazone proved to be an effective, rapid-acting, anti-inflammatory agent in 245 patients studied.

Although a metabolite of phenylbutazone, it has not demonstrated any of the side reactions of the parent compound in these short courses of therapy.

Oxyphenbutazone, combined with an appropriate antibiotic, exerts a potent bactericidal effect on local wound organisms.

In all instances of wound inflammation associated with infection, an antibiotic must be given concomitantly with oxyphenbutazone.

Oxyphenbutazone given preoperatively, reduces wound edema and local myositic reaction so that narcotic requirements are markedly reduced and early mobilization is facilitated.

Oxyphenbutazone is at present limited to oral use. The parent phenylbutazone compound may be temporarily substituted for parenteral use.

An excellent ancillary tool is hereby added to our surgical armamentarium.

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Polypoid Adenomas of the Stomach

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GASTRIC polyp was first described in the sixteenth century. However, not until the development of microscopic pathology could the wide variety of lesions causing polyps be determined. More recent studies show that only about half or two thirds of polypoid growths are epithelial in nature [*1,5,7*], the remainder being fibromas, leiomyomas, lipomas, aberrant pancreatic tissue, inflammatory conditions or other rare tumors. This paper is concerned only with epithelial polyps. The relationship of adenomatous polyps to adenocarcinoma has long been recognized, but authors do not agree as to the degree of malignant potential or the need for surgery.

Polyps may be single or multiple. Menetrier [*9*], in 1888, demonstrated that multiple polyposis occurs in two forms. The first, which he designated "polyadenome polypeux," consists of numerous sessile or pedunculated polyps occurring in atrophic gastric mucosa. (Fig. 1.) The second, "polyadenome en nappe," is a form of giant rugal hypertrophy with associated polyps which vary in size but are usually small. The polyps in this condition are often referred to as pseudopolyps and they are generally recognized to bear little or no relation to malignancy. (Figs. 2 and 3.)

Menetrier's terminology is employed more by roentgenologists than surgeons, but the terms are useful and descriptive and therefore are used in this paper.

Microscopically, adenomatous polyps are

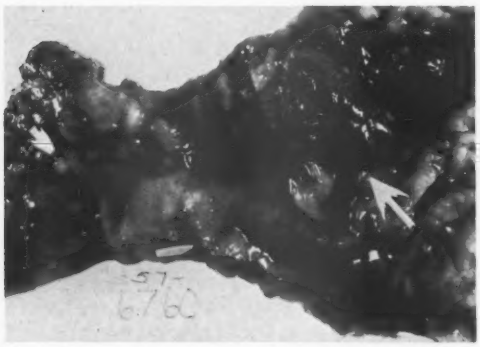


FIG. 1. Media and antrum of stomach in case of multiple polyps of polyadenome polypeux variety (Case III).

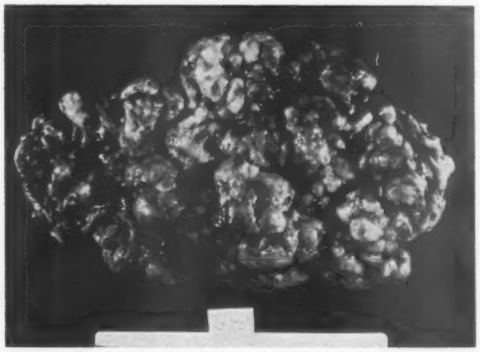


FIG. 2. Resected portion of stomach in multiple polyposis of polyadenome en nappe variety.

FIG. 3. Histologic cross section of polyp from specimen shown in Figure 2. Note that in polyadenome en nappe, the polyp is an extension of a hypertrophic rugal fold. Original magnification × 32.

composed of mucous glands, usually with a minimum of supporting submucosal tissue. The glandular structures in normal stomach are reasonably regular straight pits. In adenomas, branching occurs to a varying degree and there is marked variation in size.

MATERIAL

In an effort to shed further light on the subject, we have reviewed the cases of adenomatous polyps of the stomach seen at the Rhode Island Hospital in the twenty years prior to 1958. The twenty-three cases fell roughly into two groups; twelve were isolated polyps and eleven were multiple. In the former group, there were two cases with two polyps and the rest were single, while in the latter there were from six to scores of polyps. Not included in the series were four cases of single polyps diagnosed by x-ray films only, as some of these might not have been adenomatous polyps. In multiple polyposis, however, the x-ray picture was so typical that it seemed reasonable to include four cases in which there was no histologic confirmation.

The multiple polyps in this series break down into three groups, there being two polyadenome en nappe, eight polyadenome polypeux, two of which were malignant, and one case of Peutz-Jeghers syndrome. The latter is a rare familial type of multiple polyposis of the intestinal tract in association with spotty pigmentation of the buccal mucosa and sometimes of the skin of the face, palms or other areas. The polyps are usually maximal in the small intestine, but they may occur also in stomach and colon. In a recent report, Dormandy [4] reviewed the findings in patients with this syndrome. We have seen three of these patients, a mother and her son and daughter. Only the daughter had numerous polyps in the stomach. Her case history may be summarized as follows:

CASE I. M. I. S. was first seen at the age of seventeen years in 1936. She complained of two weeks of intermittent pain in the right lower quadrant of the abdomen. She had dark brown pigmentation inside the lower lip and similar single spots on the buccal mucosa bilaterally. An adenocarcinoma of the ileum was resected. Numerous small bowel polyps were noted.

In the next four years, she was admitted to the hospital nine times for various abdominal complaints. Polyps were evident by roentgenogram in the large and small bowel and the stomach. A Hofmeister subtotal gastrectomy was performed for "several" polyps measuring 3 to 8 mm. in diameter. An intussuscepting jejunal polyp was excised. In 1956, a gangrenous intussusception of the ileum was removed with numerous polyps. The patient is alive and well. Recent barium studies showed polyps in the large and small bowel and a 2 cm. polyp in the stomach.

FIG. 4. Case II. Multiple large polyps interpreted as extensive gastric malignancy. One polyp did have minimal malignant invasion of the base.

As would be expected, there was no malignancy in the two polyadenome en nappe patients, while two of the polyadenome polypeux patients had malignant degeneration in one polyp each. Invasion was limited to the muscularis mucosae layers. Summaries of these two cases follows:

CASE II. A. M. P., a fifty-seven year old woman, entered the hospital in March 1954, because of massive hematemesis and bloody stools. She had had pernicious anemia since 1946. She had been receiving adequate amounts of vitamin B_{12}, but anemia had been increasing for a year. On admission, her hemoglobin was 3.2 gm. per 100 ml. A gastrointestinal series (Fig. 4) was interpreted as showing extensive gastric carcinoma, but exploration revealed only multiple polyps. The lower 2½ inches of stomach were uninvolved. Therefore, the upper stomach was resected and the antrum anastomosed to the esophagus. The resected specimen contained two polyps, 4 cm. in diameter, and numerous smaller ones. One of the large polyps showed malignant invasion of the stalk. The patient has been well ever since. The results of a gastrointestinal series in 1957 were normal. She refused x-ray studies at this time.

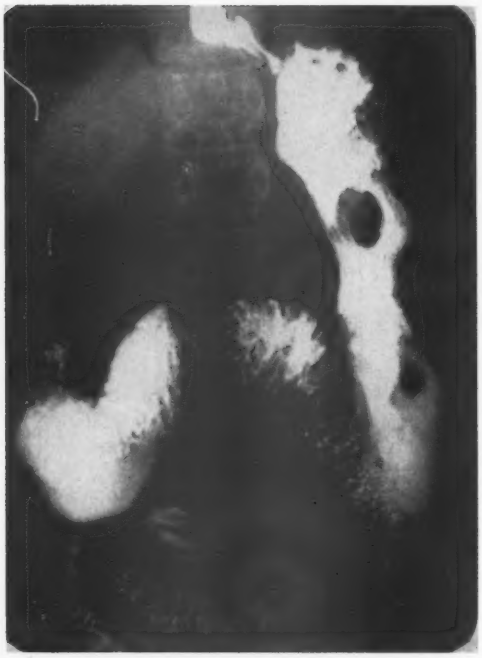


FIG. 5. Case III. Barium study of stomach in multiple polyposis of polyadenome polypeux variety.

CASE III. E. D. S., a sixty-one year old woman, was admitted to the hospital in July 1957, because of a vague history of being underweight and bothered by gaseous eructations for years. The latter symptom had been particularly bothersome just before admittance. A gastrointestinal series (Fig. 5) showed numerous gastric polyps. At operation, it was possible to do a sleeve resection saving the fundus, from which a sessile polyp was removed, and the uninvolved distal antrum. The specimen contained numerous small polyps. (Fig. 1.) In the media there was a 2 cm. sessile polyp with malignant degeneration. The patient has been well ever since, even gaining about 10 pounds in weight on a high calorie diet. A recent gastrointestinal series showed no residual pathology. (Fig. 6.)

Two of twelve isolated polyps were malignant. This is a higher malignancy ratio than noted in other series, such as that of Carlson and Ward [2] in which only six of forty-nine single polyps were malignant. Yarnis et al. [12] reported only two of seventy-three polypoid adenomas were malignant. However, our group of patients with isolated polyps included only those on whom operations were performed.

FIG. 6. Case III. Postoperative barium study after sleeve resection and resection of sessile polyp of fundus.

Summaries of the two malignant single polyps in this review are as follows:

CASE IV. A. T. was first seen in 1944 at the age of 63 years. A polyp of the stomach antrum had been discovered by barium examination a year previously. At that time he had had a brief episode of weakness, but he was admitted because of intermittent pain in the upper portion of the abdomen and vomiting for three days. A 4 cm. polyp of the antrum was found prolapsing into the duodenum and partially obstructing it. (Fig. 7). This was resected with a 1 cm. rim of normal tissue. (Fig. 8A and B.) The patient recovered well from this procedure. Fourteen years later (1958), after six months of epigastric distress, he had a Hofmeister resection for adenocarcinoma of the gastric antrum. The patient was noted to be well twenty-two months later.

CASE V. C. W., a seventy-one year old man, died in 1957 of hypertensive cardiovascular disease and a cerebral hemorrhage. At postmortem examination, a 3 cm. sessile polyp was found on the lesser curvature of the stomach near the esophagus. This had been asymptomatic. Microscopic examination proved it to be a polypoid adenocarcinoma.

AGE AND SEX

The distribution of age of the twenty-three patients was as follows: two patients were in the twenty to fifty year range, three in the fifty-one

to sixty range, eleven in the sixty-one to seventy range, six in the seventy-one to eighty range and one patient was in the eighty-one to ninety-two year range.

Seven of the twenty-three patients were men; five had benign polyps and two had malignant polyps. Only two of the sixteen women had malignant polyps. Most studies have noted the preponderance of polyps in female patients. Only one of the men in this series had multiple polyps; however, the two malignant solitary polyps were in the men.

SYMPTOMATOLOGY

Symptomatology of patients with polyps is quite diverse. Almost all of our patients complained of discomfort or pain of some sort, and nausea and vague indigestion were not uncommon. It seems not unlikely that many of their complaints were functional, with the polyps being found incidentally.

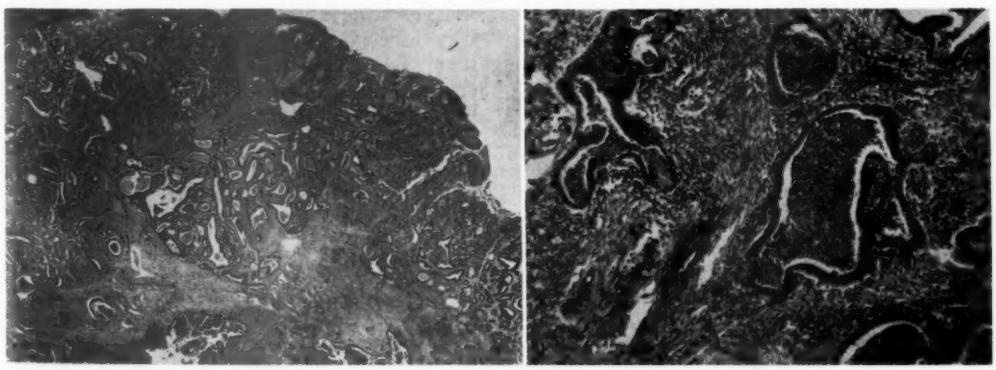
As has been noted elsewhere, the symptoms of polyps are due to accompanying gastritis, obstruction or bleeding. A large number of the patients in this series were thin and were suffering from chronic indigestion or flatulence, symptoms which are associated with achlorhydria. Two of the patients had frank obstruction; one is reported in detail (Case IV). The other had a polyadenome en nappe in which it was thought that the hypertrophic rugal folds were partially blocking the pylorus.

FIG. 7. Case IV. Gastrointestinal series showing large antral polyp prolapsing into duodenum with tendency to drag stomach downward at point of attachment. Partial obstruction.

ANEMIA

Anemia appears to be a significant finding. Hemoglobin was determined for twenty-two of our patients; seven had less than 11 gm. per 100 ml. One of the latter had massive hematemesis (hemoglobin was 3.2 gm. per 100 ml.) and another had massive dark red stools (hemoglobin was 4.1 gm. per 100 ml.)

One patient with multiple polyps, of which one was malignant, had pernicious anemia (Case II). Many authors have noted the



A B

FIG. 8. Case IV. Low (A) and high (B) power of malignant sessile polyp again showing invasion of muscularis mucosa in high power. Original magnification of A × 140 and of B × 24.

FIG. 9. Barium study in multiple polyposis of polyadenome en nappe variety. Compare with gross photograph (Fig. 2) and contrast with x-ray in polyadenome polypeux (Fig. 5).

coexistence of adenoma of the stomach and pernicious anemia. Rigler et al. [*10*] reported a 7 per cent incidence of benign gastric tumors in patients with this disease. In the course of this study, one other case of pernicious anemia with a single polyp was excluded from the series because of lack of pathologic confirmation. As carcinoma of the stomach is also thought to have an increased incidence in patients with pernicious anemia, the need for periodic studies of the upper gastrointestinal tract in persons with this disease seems obvious.

ROENTGENOLOGIC FINDINGS

Inasmuch as history is either of no help or merely suggests upper gastrointestinal disease and there are no positive physical findings, heavy reliance must be placed on barium examination of the stomach. Roentgenographically, adenomas are visualized as rounded smooth filling defects often with visible short pedicles. Ulceration is not demonstrable. Sessile adenomas are often less distinct. In sessile or pedunculated polyps peristaltic activity is not interrupted as it often is in malignancy.

Polyadenome en nappe with its giant rugal folds gives an entirely different roentgenographic picture. The rugal hypertrophy is the outstanding characteristic, and the polyps themselves, being small, are hard to detect. (Fig. 9.)

Hay [*6*] has pointed out that size is our best criterion for malignancy, with those lesions over 2 cm. having a high malignancy rate. In our series, all five malignant tumors were 2 cm. or more in diameter. There were also two polyps, one 3 cm. and the other 6.4 cm. in diameter, in which no malignancy could be found. All but two patients in this series had barium studies. Of these two, one had a single malignant polyp found incidentally at post mortem (Case v); the polyp in the other patient was encountered and removed during cholecystectomy.

While the gastrointestinal series were helpful in demonstrating tumors in our patients, quite obviously carcinoma could not be seen in those polyps with malignancy confined to the polyp. Perhaps the most striking finding in our series was that of nine gastrointestinal series, carried out in patients whose polyps were later proved benign pathologically, the interpretations of four were malignant polyps. (Fig. 4.)

DIAGNOSTIC AIDS

Other diagnostic aids are gastroscopy and gastric analysis. Unfortunately, these procedures were infrequently utilized in our series. Five gastric analyses were performed. All showed achlorhydria except one in which 10 units of free hydrochloric acid was present after histamine stimulation. These findings are in accordance with those of others [*3,12*], that acid is usually absent, and support the contention that the polyps usually arise in abnormal mucosa.

Four patients were examined gastroscopically and polyps were seen in all. However, they were already known to be present by roentgenography. The value of the procedure in demonstrating polyps of significant size would appear to be slight in the presence of good roentgenology. Rubin [*11*] has cited five instances in which polyps were found by gastroscopy, with roentgenology demonstrating polyps in only one of them. The size of these polyps is not mentioned.

FOLLOW-UP STUDIES

Results of the follow-up studies of patients with solitary polyp are as follows: Of ten patients with benign polyp, three were well (negative gastrointestinal series) six, five and three years after operation. Two were well (no gastrointestinal series) seven and four years later; the latter was lost to follow-up after four years. Five died without evidence of malignancy fifteen, eight, seven and one years and two weeks after operation. One (Case IV) of the two with a malignant solitary polyp was well sixteen years after operation although carcinoma of the antrum developed fifteen years after the polyp had been removed from this region. The other was a postmortem finding only.

Follow-up data for patients with multiple polyps are the following: Three of five, who were not operated on, died without evidence of malignancy four and two years and one week after diagnosis was first made. Two were not followed. Of the four patients with benign polyps who had operations, two were well (negative gastrointestinal series) three and two years later. One was well (no gastrointestinal series) two years after operation. One was well (Peutz-Jeghers syndrome) nineteen years later at which time gastrointestinal series revealed a recurrent polyp. The two patients, who were operated on for malignant multiple polyps, were well (negative gastrointestinal series) five and two years postoperatively.

Repeat barium studies were carried out on all patients who would submit to the procedure. Although follow-ups are short in most instances, it is interesting to note that there was no case in which a new polyp occurred after previous polypectomy in the entire solitary polyp group. The importance of occurrence of an adenocarcinoma after removal of a malignant polyp in one patient (Case IV) is discussed later.

The only operative death occurred in the solitary group in a sixty year old woman two weeks after a subtotal gastrectomy for a 6.4 by 3 cm. sessile polyp. This was the only solitary benign polyp for which more than a simple excision, including a generous base, was performed. She had numerous complications, including evisceration and atelectasis.

In the multiple group in the five resected patients having follow-up barium studies, there is only one visible polyp and this in the patient with Peutz-Jeghers syndrome. All these patients had some sort of a subtotal resection indicating that there is usually enough stomach free of disease to permit leaving some sort of a pouch. This would seem to be preferable whenever possible, especially as these patients are often thin to begin with.

COMMENTS

From the foregoing facts it would appear possible to present a rational approach to surgical treatment in instances of gastric polyps. Isolated polyps should be removed in patients who are reasonable risks if they are causing obstruction or anemia. Polyps over 2 cm. in diameter should also be removed because of the high malignancy rate. Smaller asymptomatic lesions can be observed at six month intervals and removed if increase in size is noted. However, inasmuch as a barium study every six months is a burden for a young patient, excision of such polyps is frequently warranted. The occurrence of gastric malignancy at the site of previous removal of benign polyps has been reported [*5,6*]. It will be remembered that our Case IV had excision of a malignant polyp of the antrum, followed fifteen years later by adenocarcinoma of the antrum. These cases indicate that excision of a polyp does not warrant discharge of the patient. Barium studies would not seem to be needed as frequently as in the unresected patient, however. Excision should always be carried out with a wide base of stomach wall.

In multiple polyposis of the polyadenome polypeux type, the rate of malignancy is high enough to warrant surgery in all patients who are reasonable risks. Preservation of a small amount of uninvolved stomach is usually possible and is certainly desirable. Cases II and III in this series are good examples of this.

Routine surgery is not recommended for multiple polyposis of the polyadenome en nappe variety as there is no good evidence that this is a precursor of malignancy. In one patient in our series, sufficient hypertrophic mucosa was obstructing the pylorus to warrant partial gastrectomy, leaving the relatively uninvolved fundus.

In those unfortunate persons afflicted with Peutz-Jeghers syndrome, surgery, of necessity, has to be reserved for obstructing polyps only or already cancerous disease. The polyps

are so extensive that prophylactic resection is impossible.

SUMMARY

Patients with polypoid adenomas of the stomach may be divided into two groups, those with solitary and those with multiple polyps. A series of twenty-three patients is reviewed with emphasis on clinical findings and management. There were four malignant polyps in the series indicating the need for careful observation and frequent surgery. Polyps over 2 cm. in diameter should be excised.

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The Influence of Arteriosclerotic Heart Disease on Surgical Risk

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ADVANCE into old age generally carries with it a significant degree of coronary arteriosclerosis with or without clinical manifestations of cardiac impairment. Several studies have suggested that in patients with coronary artery disease the risk of surgery is only slightly greater than in the control group [*5,6,9,12,13, 21,26*] while other reports indicate that the hazard is materially increased by the presence of coronary artery disease [*3,20,24,28,29*]. Marvin [*21*], Poindexter [*29*], and Dry [*9*] believe that the cardiac patient who is carrying on his usual activities without symptoms (Class 1) should withstand operation as well as the individual with a normal heart. In contrast Morrison [*24*] and Maher et al. [*20*] emphasize the point that the ateriosclerotic heart which is functioning adequately may fail under the stress of surgery. The study reported here was undertaken bebecause of the diverse opinions expressed in the literature and at medical conferences, and to obtain data which might be helpful in answering the recurring question of the advisability of performing elective surgery upon such cardiac patients.

MATERIAL

During the past three years 9,050 major operations were performed on the surgical services of this hospital. From this group the records of 165 patients with arteriosclerotic heart disease who underwent 200 major operations were available for study. The diagnosis of arteriosclerotic heart disease was established by a history of angina pectoris, a previous proved myocardial infarction, symptoms and signs of congestive failure or the presence of an abnormal electrocardiogram. Cases of rheumatic and syphilitic heart disease were excluded. However, because of the close association between hypertension and arteriosclerosis, patients were included in this study if their blood pressures were greater than 150/90 mm. Hg and their electrocardiograms were abnormal. In addition to the cardiac status the data abstracted from the records also included the patient's age, type and duration of operation, anesthetic agent, blood pressure during operation and the nature of the postoperative course.

Table 1 lists the types of operations performed upon these patients with heart disease. It may be noted that only 4.5 per cent of the cardiac group had gynecologic operations;

TABLE 1
TYPES OF MAJOR OPERATIONS PERFORMED ON 165 PATIENTS WITH ARTERIOSCLEROTIC HEART DISEASE

Operations	Number	Per cent
Laparotomy		
Intestinal tract	52	26
Biliary system	24	12
Gynecologic*	9	4.5
Genitourinary*	31	15.5
Extremity	25	12.5
Herniorrhaphy	15	7.5
Mastectomy (radical)	8	4
Miscellaneous*	36	18
Total	200	100

*The majority of the gynecologic procedures were hysterectomies. In the genitourinary group, twenty-seven of the thirty-one operations were prostatectomies. Miscellaneous operations include sympathectomies, neurosurgical and thoracic procedures.

TABLE II

MORTALITY AND MORBIDITY FOLLOWING MAJOR OPERATIONS IN PATIENTS WITH AND WITHOUT ARTERIOSCLEROTIC HEART DISEASE

Cardiac Status	Cases (no.)	Mortality			Complications		
		Cardiac (%)	Other (%)	Total (%)	Cardio-pulmonary (%)	Other (%)	Total (%)
I. All cases (majority no heart disease)	6,059	...	...	3.5	0.7	6.3	7.0
II. Arteriosclerotic heart disease	200	9.0	1.5	10.5	10.5	8.5	19.0
(1) Asymptomatic	103	8.7	2.9	11.6	13.6	8.7	22.3
Electrocardiographic changes only	63	12.7	3.2	15.9	14.3	9.5	23.8
Electrocardiographic changes and hypertension	40	2.5	2.5	5.0	12.5	7.5	20.0
(2) Symptomatic	97	9.3	0	9.3	7.2	8.2	15.4
Previous to time of surgery	54	11.1	0	11.1	9.3	7.4	16.7
At time of surgery	43	7.0	0	7.0	4.7	9.3	14.0

whereas, of the total number (9,050) of operations performed during the period of study over 20 per cent were done on the gynecologic service. Because of this large proportion of gynecologic procedures and the very low mortality rate (0.4 per cent), the inclusion of these cases among the control group would have the net effect of lowering the mortality rate for the total operated population of this hospital. For this reason and since complete data were not readily available for all of the urologic cases, it seemed advisable to use only the 6,059 major operations performed on the *general surgical service* as most representative of the control group with which to compare the risk of surgery among patients with coronary artery disease.

FINDINGS

Mortality and Morbidity in Cardiac Patients. From a practical viewpoint the cases appeared to fall into two groups; namely, (1) those patients (103) who were asymptomatic, and in whom the diagnosis of heart disease was established on examination and by laboratory tests at the time of admission for the treatment of their surgical problem, and (2) those patients (ninety-seven) who had been hospitalized previously for their heart conditions or who had symptoms at the time of operation (Table II). Sixty-three of the 103 asymptomatic patients in Group 1 had electrocardiographic changes as their only manifestation of myocardial disease, while forty patients had hypertension in addition. In Group 2 there were fifty-four patients who had no cardiac symptoms or signs at the time of operation and forty-three others who despite therapy had a persistence of chest pain, dyspnea, cyanosis, peripheral edema or basal rales. The mortality and complications are listed as those due to cardiopulmonary causes and all other varieties.

In Table II it may be seen that the mortality and complication rates for the control group were 3.5 per cent and 7.0 per cent, respectively, while the values for the cardiac patients were 10.5 per cent and 19 per cent. Thus the risk of major surgery in patients with heart disease was about three times as great as in those of the control group, and the complications were over two times as frequent. Further there was a much higher incidence of cardiopulmonary complications among the cardiac patients subjected to surgery than among the total operated population. The presence or absence of cardiac symptoms (Groups 1 and 2) did not affect significantly the mortality or complication rates. And finally the presence of hypertension in addition to coronary artery disease did not increase the surgical risk. This latter observation has been noted by others [*5,13,24,32*]. Of the twenty-one cardiac patients who died postoperatively, there were nine patients in whom correction of the surgical lesion could have been associated with long term survival.

The literature contains several comparable series which report the operative mortality

TABLE III

COMPARISON OF MORTALITY AND MORBIDITY RATES IN NORMAL AND ARTERIOSCLEROTIC PATIENTS (COLLECTED SERIES)

Authors	Hospital	Year	Controls		Cardiac Patients		
			Operations (no.)	Mortality (%)	Operations (no.)	Mortality (%)	Complications (%)
Sprague	Massachusetts General	1929	...	...	88	18.2*	...
Butler et al.	Peter Bent Brigham	1930	...	...	278	5.8†	...
Hickman et al.§	University of Chicago	1935	...	...	103	9.7*	12.6‡
Brumm and Willius	Mayo Clinic	1939	...	...	257	4.3*	...
Morrison	New York	1948	9,137	2.8	485	14.8	4.3
Hannigan et al.	Memorial (New York)	1951	260	3.4	58	5.2	24.1‡
Lochhead et al.	George Washington University	1954	...	...	51	6.0	6.0
Etsten et al.‖	New England Center	1954	4,154	2.0	1,624	3.4	...
Nachlas et al.	Sinai of Baltimore	1959	6,059	3.5	200	10.5	19
Combined series	...	...	19,610	2.9	3,144	6.6	10.1

* Some authors indicated cardiac deaths only in their mortality figures.

† These authors separated their deaths into expected and unexpected groups, rather than cardiac and noncardiac. Their mortality rate includes only the expected deaths.

‡ These authors listed only the cardiorespiratory complications.

§ The data from Hickman and associates comprise all cases listed as myocardial disease, coronary thrombosis and angina pectoris. Both major and minor operative procedures were included although there were only a small number of the latter.

‖ The comparatively low mortality among the cardiac patients of this series may be due to the fact that only 60 per cent of the operations were considered major procedures.

among patients with arteriosclerotic heart disease (Table III). There is a rather marked variation in the mortality rates from the different clinics (from 3.4 to 18.2 per cent) and in several of the studies a comparable control group is lacking. The variation may be due partly to the fact that in some reports the mortality figures refer to cardiac causes alone, while in others all postoperative deaths are included. Furthermore, differences in the number of emergency operations performed at the different hospitals and in the per cent of patients with malignant disease would result in some variation in the mortality rates [*3,11,14,27,35*]. Nevertheless, when the combined series are considered, it is apparent that the risk of surgery in patients with arteriosclerotic heart disease is about twofold greater in the cardiac patient than in those with normal hearts.

Somewhat less attention has been paid to the morbidity in these patients following operation (Table III). The excessively high rate of cardiorespiratory complications in the report from the Memorial Hospital [*13*] may be due to the fact that most of their operations were performed on patients with malignant disease. Since the complication rates of the control groups were not listed in these tabulated reports, it is not possible to determine how much more frequently complications occurred among cardiac patients at the various hospitals listed. However, from the data obtained at our hospital (Table II) it may be seen that postoperative complications were more than twice as frequent among the cardiac group as they were in the control group.

Mortality and Morbidity in Relation to the Clinical Manifestations of Heart Disease. A large number of patients admitted for surgical treatment have one or more abnormalities of

TABLE IV
RELATION OF THE TYPE OF CARDIAC MANIFESTATION TO THE OPERATIVE MORTALITY AND MORBIDITY IN PATIENTS WITH ARTERIOSCLEROTIC HEART DISEASE

Cardiac Abnormality	Authors	Operations (no.)	Mortality (%)	Complications (%)
Myocardial disease*	Sprague	75	32	...
	Butler et al.	167	4.9	...
	Hickman et al.	92	8.7	15.2
	Morrison	507	13.6	5.5
	Nachlas et al.	107	8.4	12.1
	Combined series	948	12.4	7.8
Angina pectoris	Sprague	13	30.8	...
	Butler et al.	41	7.7	...
	Hickman et al.	3	33.3	33.3
	Morrison	58	8.6	1.7
	Lochhead et al.	21	0	9.5
	Nachlas et al.	41	12.2	19.5
	Combined series	177	10.2	9.8
Myocardial infarction	Butler et al.	8	12.5	...
	Hickman et al.	8	12.5	50
	Morrison	37	8.1	2.7
	Hannigan et al.	58	5.2	24.1
	Lochhead et al.	30	10	3.3
	Nachlas et al.	52	13.5	32.7
	Combined series	193	9.3	20

* Myocardial disease includes categories listed by various authors as "arteriosclerotic heart disease," "hypertensive heart disease," "coronary artery disease" and "chronic myocarditis."

their cardiovascular system to justify the diagnosis of chronic myocardial disease or arteriosclerotic heart disease. Another group are those who have had a myocardial infarction in the past, while still a third group are patients whose coronary artery disease is manifest by the presence of angina pectoris. The question of whether the surgical risk is influenced by the manner in which the heart disease manifests itself has been the subject of a number of reports [*5,13,15,19,24,32*].

Table IV classifies patients with angina pectoris or myocardial infarction and compares them with the less specific diagnosis of myocardial disease. Under the latter classification are included all of those cases listed as arteriosclerotic heart disease, chronic myocarditis, abnormal rhythms or congestive failure. Cases of rheumatic or syphilitic origin are excluded. The other two classifications are self-explanatory, except that the group of myocardial infarction refers only to those patients with such a diagnosis made some time previous to surgery. It may be seen in Table IV that the presence of angina pectoris or a history of myocardial infarction does not denote a greater hazard with regard to postoperative fatality than does the presence of myocardial disease without these cardiac manifestations. In contrast, a recent infarction or the presence of congestive failure have been recognized for many years as perilous states during which surgery should be avoided [*5,8,9,20,28*]. An explanation is not apparent for the increased complication rate among the patients with previous myocardial infarction (Table IV).

Comparison of Age and Coronary Artery Disease in Relation to Surgical Risk. In several early papers it was noted that the majority of postoperative deaths occurred in patients over fifty years of age [*5,32*]. Later studies compared the mortality among surgical patients over the age of sixty with the younger group [*3,8,11,14, 26*]. More recently some surgeons have believed that the years sixty to sixty-nine do not place one in the older age group and thus have studied the operative tolerance of patients over seventy years of age (Table V). While the data revealed almost uniformly that the mortality and morbidity were significantly greater with increasing age, the conclusions of the authors varied from the observation that major surgery can be performed in the aged with reasonably low risk [*13,23–25,27,33*] to the statement that age has a considerable influence on risk [*3–5,14,28,32*].

Whether age and arteriosclerotic heart disease represent the same or different influences upon surgical risk has not been clarified. In some reports in which age was the factor analyzed, a comparison was made between elderly patients with and without heart disease. Bosch et al. [*3*] found a mortality rate of 34.1 per cent in patients over sixty years of age with myocardial disease, while in patients of a similar age group without heart disease, the mortality rate was only 6.6 per cent. However, in another group of elderly patients the incidence of heart disease was nearly the same among those surviving and those succumbing to major operations [*23*]. In studies designed to evalute the influence of heart disease and in which age was also considered, opinions were divided as to whether the older cardiac patient represented a poorer surgical risk than the younger one [*4,5,13,24,28*].

A satisfactory method of differentiating the influence of age from that of arteriosclerotic heart disease would be to compare mortality and morbidity rates among younger and older

TABLE V

INFLUENCE OF AGE AND URGENCY OF OPERATION ON SURGICAL RISK (COLLECTED SERIES)

Age Group	Authors	Operations (no.)	Mortality (%)	Mortality (%)		Mortality Controls (%)
				Elective Operations	Emergency Operations	
Over sixty years	Estes (1949)	400	6.5	5.0	16.4	2.1
	Parsons et al. (1949)	322	9.4	5.0	12.5	1.1
	Bosch et al. (1952)	500	9.6	8.8	17.4	3.0
	Haug and Dale (1952)	354	9.0	5.7	21.9	...
	Cole (1953)	1,099	5.1	...	...	2.1
	Combined series	2,675	7.2	...	...	...
Over seventy years	Welch (1948)	609	10.2	13.8*	39*	...
	Childs and Mason (1949)	99	17.2	...	...	...
	Owen and Murphy (1952)	434	27.2	22.6	33.5	...
	Anglem and Bradford (1953)	621	10.0	10.0*	19.0*	...
	Stewart and Alfano (1954)	290	13.0	...	...	...
	Mithoefer and Mithoefer (1954)	240	8.3	...	...	1.9
	Parsons et al. (1956)	146	8.2	6.6	20.8	1.1
	Limbosch (1956)	336	20.5	16.6*	30.0*	...
	Nachlas et al. (1959)	77	14.3	...	...	3.5
	Combined series	2,852	14.3	...	...	...

* These findings were based on elective and emergency abdominal operations only.

patients who were subjected to operations of comparable magnitude and who differed only by the presence or absence of heart disease. That this type of comparison could not be made became apparent when one looked for patients without heart disease who were over seventy years of age. Many patients asymptomatic with respect to their hearts nevertheless exhibited abnormal electrocardiograms. This finding placed them in the "asymptomatic heart disease group" as described above. In our hospital there were too few patients for study who were over the age of seventy and whose work-up indicated that they might be considered as elderly patients without evidence of heart disease.

Thus the attempt to separate the influences of age and heart disease could be approached only by looking for differences between younger and older patients with heart disease, who were subjected to major operations. If age differences actually reflected the amount of arteriosclerosis and arteriosclerotic heart disease, one might expect little or no difference in mortality between the various age groups when all those selected were known to have heart disease. The data obtained at our hospital (Table VI) indicated that in those patients under seventy years of age the mortality rate was 8.1 per cent, while in the older age groups it was 14.3 per cent. These differences are not statistically significant when the chi square calculation is applied. The findings tend to minimize the importance of age alone. However, the likeli-

TABLE VI

INFLUENCE OF AGE ON MORTALITY AND MORBIDITY IN PATIENTS WITH ARTERIOSCLEROTIC HEART DISEASE

Age Group	Cases (no.)	Mortality* (%)	Complications (%)
Under seventy years..	123	8.1	20.3
Over seventy years...	77	14.3	16.9

* In applying the chi square calculation for these differences, a value less than 2.0 is obtained. This indicates that the observed difference in mortality rates might occur as a result of chance one in six times.

TABLE VII

RELATION OF ANESTHETIC AGENT AND DURATION OF OPERATION TO SURGICAL RISK IN CARDIAC PATIENTS

Category	Operations (no.)	Mortality (%)	Complications (%)
Inhalation anesthesia	115	9.6	22.6
Spinal anesthesia	69	10.1	17.4
Miscellaneous*	16	18.8	0
Operation under two hours	127	7.9	19.7
Operation over two hours	73	15.1	17.8

* The miscellaneous anesthetics included nine local infiltrations, five with combinations of agents and two with the hibernation technic. The more serious nature of the illnesses in these patients is probably responsible for the higher mortality rate.

TABLE VIII

INFLUENCE OF HYPOTENSION DURING OPERATION UPON THE OCCURENCE OF CARDIAC DEATHS AND COMPLICATIONS

Operative Blood Pressure	Operations (no.)	Mortality		Complications	
		(no.)	(%)	(no.)	(%)
Stable	148	12	8	18	12
Hypotensive	52	6	12	3	6

hood of a difference as large as this (8.1 per cent as compared to 14.3 per cent) occurring as a result of chance is approximately one in six. The over-all impression gained from studies concerning the influence of both age and heart disease on surgical risk leads us to believe that whereas the increased risk in the aged is due in large part to the presence of more advanced arteriosclerotic heart disease, the effects of other factors, which are more apt to be present in older patients, cannot be neglected entirely.

Effects of the Anesthetic Agent and the Duration of Operation. Although spinal anesthesia has received a bad reputation, and this indictment has been supported by a few publications [*17,24*], the majority of the reports [*3,11,13,25, 27,32*] indicate that this attitude is unjustified. Most observers appear to agree with Marvin [*21*] that the proper anesthetist is more important than the anesthetic agent employed. Our findings (Table VII) also support this viewpoint in that both the morbidity and mortality were no greater among patients receiving spinal anesthesia than among those receiving inhalation anesthesia.

Several studies have indicated that speed is important in the performance of surgical procedures upon the aged and on those with heart disease [*8,13,16*]. Operations lasting longer than two hours have been shown to be associated with higher mortality in some institutions [*8,13,16*] but not in others [*12,24*]. The mortality rate among patients at our hospital whose operations required more than two hours was almost twice that of patients having shorter operations (Table VII). Although the rate differences when subjected to statistical analysis do not establish any increased risk for the longer procedures ($\chi^2 = 2.0$), the likelihood of this difference occurring as a result of chance is one in seven. Morbidity rates among the two groups were approximately equal. The failure to note a truly significant increase in risk with procedures longer than two hours may have resulted from a certain amount of unconscious selection. Longer procedures were performed most probably on those patients who were considered better risks, while the poorer risk patients had shorter procedures which were limited to the simplest correction of the surgical condition. Such unconscious but sensible selection would tend to minimize the mortality and morbidity differences between long and short operations. Most of the evidence supports the viewpoint that in patients of substandard risk the shortest operation is most apt to be the safest.

Danger of Hypotension During Operation. The serious nature of a fall in blood pressure during operation has been mentioned by numerous investigators [*12,17,22,34*]. They have reported that the occurrence of a coronary occlusion during the postoperative period is associated with some degree of hypotension during the operation in 60 per cent of the cases. In fifty-two of the 200 operations reviewed in this study (Table VIII) a fall in blood pressure greater than 40 mm. Hg (systolic) or 20 mm. Hg (diastolic) was recorded for varying periods of time during operation. In twelve of these patients the pressures fell to shock levels during surgery. The mortality in those patients with some degree of hypotension was 11.5 per cent,

while an 8.1 per cent mortality was noted among those whose pressures remained stable during operation. These observed differences are not statistically significant. The same comment applies to the differences in the incidence of complications. It was also of interest to note that there were forty-three patients who had a significant fall in blood pressure without any serious consequence. Furthermore, twelve patients died of cardiac causes and eighteen developed nonfatal cardiac complications even though their blood pressures remained stable during the operative procedures. Thus, although it would seem desirable to maintain a normotensive state during operation, the data from this study do not indicate that a short period of hypotension during the operative procedure is hazardous; nor does the absence of an operative alteration in blood pressure eliminate the possibility of a cardiac catastrophe occurring. An important point, which has been emphasized by others [*22,34*] and deserves reiteration, is that postoperative infarction may present an atypical clinical picture, and the diagnosis should be considered when the postoperative course is not smooth.

COMMENTS

When arteriosclerotic heart disease is accompanied by a surgical lesion, what factors should influence the course of our action? First the urgent nature of the surgical problem must be considered. There is no argument against the immediate performance of life-saving procedures such as the control of massive hemorrhage or the closure of a visceral perforation. However, there are a number of diseases about which opinions vary considerably as to the urgency of operative intervention. These include acute cholecystitis, certain sealed visceral perforations (some cases of peptic ulcer, appendicitis and sigmoid diverticulitis) and nonstrangulating intestinal obstruction. While different opinions may be justified with respect to the management of these surgical lesions among the general hospital population, the argument for avoiding immediate operation among cardiac patients is supported by an abundance of reported data.

Before elective surgery is undertaken, it is necessary to recall that, although most of the symptomatic manifestations of heart disease do not affect the surgical risk, there are two exceptions: the presence of congestive failure or a recent myocardial infarction. Treatment for cardiac decompensation can often bring the patient into the realm of relative safety for operation. Recognizing the existence of a recent coronary occlusion is of utmost importance for the mortality is high following any operation upon the patient who has sustained recent myocardial infarction. In contrast elective surgery may be done without excessive danger if it is delayed from four to six months after the coronary artery occlusion. The other feature to be considered before recommending elective surgery is the gravity of the surgical lesion as compared with the cardiac status. In patients, whose life expectancy is short because of advanced myocardial disease, elective operations are certainly contraindicated, and one might even question the advisability of doing radical surgery for anticipated long term cure of a malignancy. On the other hand, if one anticipates that the patient might live for a number of years despite his injured myocardium, malignant processes should be extirpated. Benign lesions must be evaluated as to the likelihood of their precipitating a more serious challenge to the patient's health at a later time when they might require an emergency operation.

SUMMARY

A study has been made of 165 patients with arteriosclerotic heart disease who underwent 200 major surgical procedures. An analysis has been included of the reports from several other clinics concerning the risk of surgery in the aged and in patients with arteriosclerotic heart disease. From these combined data the following statements appear to be justified:

1. Mortality and morbidity rates are two to three times greater among cardiac patients subjected to operation than among the total operated population.

2. The symptomatic manifestations of myocardial disease do not influence the mortality significantly, with the exception of congestive heart failure and recent infarction. Patients with angina pectoris, hypertension or healed myocardial infarction are not greater surgical risks than are those in whom the diagnosis of arteriosclerotic heart disease is made without symptoms being present. Conversely these findings emphasize the importance of handling the asymptomatic cardiac patient as carefully as

one having symptoms, when operation is being considered or undertaken.

3. The increased risk of surgery in the aged is due in large part but not entirely to the presence of arteriosclerotic heart disease. This statement is supported by the finding that, although mortality rates are significantly greater in patients over seventy years of age as compared with those of younger patients when age alone is considered, such age differences lose much of their statistical significance when all in the study group have heart disease. That other diseases, which are more likely to be present in older patients, also exert an influence is suggested by the observation that the mortality rate was greater for the aged group than for patients of all ages having arteriosclerotic heart disease.

4. Operative risk is not influenced by the choice of the anesthetic agent employed.

5. Although alterations in blood pressure during operation should be avoided if possible, the occurrence of hypotension for short periods of time is not necessarily associated with catastrophic sequelae. Furthermore, a stable blood pressure during operation does not eliminate the possibility of a myocardial infarction appearing in the postoperative period.

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Normal Physiologic Vaginal Douches

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SOME physicians still prescribe alkaline substances, sodium perborate, borax, sodium bicarbonate and substances such as potassium permanganate, magnesium sulfate, copper sulfate and sodium chloride, or a combination of these in the treatment of vaginal leukorrhea [*1,2*]. Others advocate douches of sodium bicarbonate in sterility, or as a hygienic douche. It has been definitely and scientifically established that the normal hydrogen ion concentration (pH) of the adult vagina is markedly acid (pH 3.0 to 4.2). This acidity is much lower than we used to believe.

When pathologic changes occur in the vagina, such as a vaginal infection, the hydrogen ion concentration (pH) begins to move toward the alkaline side of the pH scale. This represents a mild, moderate to severe hypoacidity of the vagina, similar to hypochlorhydria of the stomach. Just as one would not prescribe an alkaline medication for hypochlorhydria, so in vaginitis, the vagina should be correctly acidified rather than hypoacidified or alkalinized. The significance of the symbol (pH) is shown in Table I.

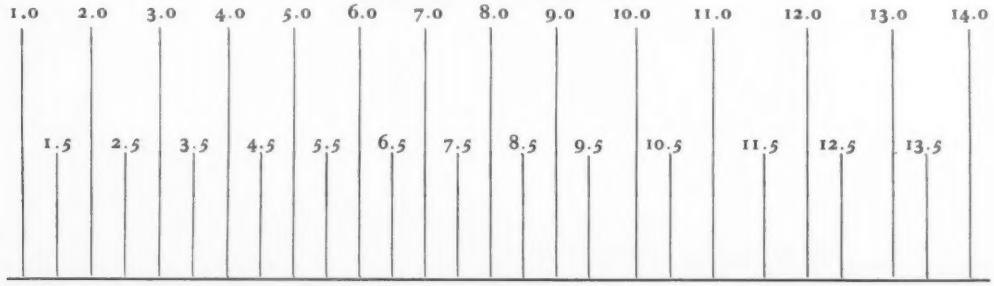
VAGINAL PHYSIOLOGY

The physiology of the normal vaginal pH should be logically considered before a rational approach to treatment may be undertaken. At the Jefferson Davis Hospital, now in the Obstetrical and Gynecological Research Institute, and in the author's private practice, exhaustive studies are being made of vaginal hydrogen ion concentration (pH), vaginal epithelial cellular height, vaginal bacterial flora and glycogen content of the vaginal epithelial cells. The way in which glycogen is metabolized into glucose and finally into lactic acid is also being studied. Glucose is removed from the blood stream and deposited in the vaginal epithelial cells where it is converted into glycogen. Glycogen is then converted into various chemicals. The end product is racemic lactic acid. Lactic acid produces normal acidity in the vagina with a pH of 3.0 to 4.2. (Table II, Fig. 1.)

The reaction of the normal vagina is acid when it is tested with nitrazine paper, Hellige, Wulff, electrometric or electronic pH methods. Vaginal pH has been recorded in over 5,000 obstetric and 5,000 gynecologic patients in the various clinics. Both private and ward patients

TABLE I

SIGNIFICANCE OF SYMBOL, pH



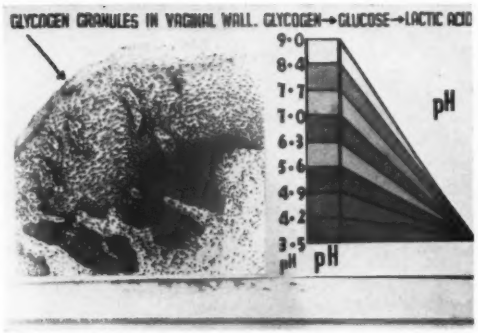


FIG. 1. Shows the glycogen granules in vaginal wall. This glycogen is broken down into glucose and finally into lactic acid which produces a pH of 3.0 to 4.2.

FIG. 2. Shows the moist layer covering the vaginal epithelial surfaces. The vaginal pathogens live in this moist layer and in the moist layer which extends down into the folds, cracks and crevices in the vaginal walls. Surface-acting agents remove this layer from the vaginal surfaces which permits medication to spread to where the pathogens live.

were tested. Most normal vaginas had a pH between 3.5 to 4.2.

Chemical investigations of vaginal douches and various vaginal leukorrheas in our laboratories have added more scientific data about these two subjects. It has been found that the pH of a vaginal douche preparation means absolutely nothing, because there are other very important factors that must be present in the douche preparation. For example, the douche must be correctly buffered and contain the correct amount of "surface-acting," "explosive," "spreading" agents and vaginal adhesives. To be specific, the buffering agent of a douche solution maintains the pH within a narrow limit, regardless of the pH of the vaginal secretion and the pH of the vaginal walls. If a vaginal douche or medication which has a pH of 4.0 is not buffered and is introduced into an infected vagina which has a pH of 6.0, the resulting pH is near pH 6.0 rather than pH 4.0.

The surface-acting agents facilitate penetration of the vaginal douche solution and vaginal medications deep down into and between all the folds and rugae of the vaginal mucosa, as well as being powerful trichomonicides and bactericides.

Chemical and physical properties of buffering and surface-acting agents were revealed as a result of studies of these substances in more than 1,000 vaginas during the past twenty-five years. These observations were made during and after various douche preparations were used by the patient at home or the douche preparation was given in the writer's office. (Figs. 2, 3 and 4.)

TABLE II
THE PRODUCTION OF NORMAL AND ABNORMAL ACIDITY OF THE VAGINA*

The Sugar:	Enzymes and Other Substances Necessary for This Metabolism
Glycogen	Phosphorylase
to	
Glucose-1-phosphate	
to	
Glucose-6-phosphate	Phosphoglucomutase, plus Mn, Mg, Co, and cysteine
to	
Fructose-6-phosphate	Phosphohexoisomerase
to	
Fructose-1-6-diphosphate	Phosphohexokinase, (ATP) Adenosine triphosphate, Mg, and ADP (Adenosine diphosphate)
to	
D-glyceraldehyde-3-phosphate	Aldolase, plus Fe, Zn, pH 9.0
to	
1,3-diphospho-D-glycerate	Triose phosphate dehydrogenase, Co enzyme I and Co enzyme II pH 8.6
to	
3-Phosphoglyceric acid	Phosphoglyceric Transphosphorylase, ATP, Mg and Mn ions
to	
2-Phospholyceric acid	Phosphoglyceromutase
to	
(Enol) phosphopyruvic acid	Enolase, K and Mg ions ATP, phosphopyruvate
to	
Pyruvic acid	Transphosphorylase, K and Mg ions
to	
Lactic acid	Lactic acid dehydrogenase, Co enzyme I and Co enzyme II Normal vaginal pH of 3.0 to 4.2 is due to this lactic acid

*LARDY, H. A. Respiratory Enzymes. Minneapolis, 1949. Burgess Printing Co.

VAGINAL PH RECORDINGS

The following is a summary of 713 consecutive electrometric pH recordings done on 163 consecutive private gynecologic patients who came to my office. (Table III.)

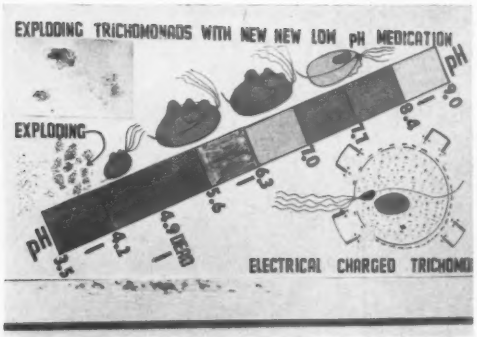


FIG. 3. Exploding trichomonads and other vaginal pathogens. By lowering the vaginal pH below 3.0 the vaginal pathogens explode.

The average pH as recorded in the vagina of various vaginal conditions are shown in Table IV.

The vaginal pH in forty-one consecutive Candida albicans vaginal infections was also recorded. (Table v.) The vaginal pH in sixty-five consecutive Trichomonas vaginalis infestations are shown in Table VI.

Determinations of pH were made along the entire length of the posterior, anterior, left and right lateral vaginal walls, from the fornix, deep in the vagina to the introitus and on the right, left, anterior and posterior areas of the cervical face. This result is compared with those of previous studies of fifty-two consecutive normal vaginas. Table v shows the pH range of the normal vagina (3.0 to 4.2).

In view of these observations, it might appear logical that all medications and vaginal douches should be correctly acidified and correctly buffered, but precaution should be taken not to produce a pH so acid that it will cause an irritation or burning to the vaginal epithelium and perineum.

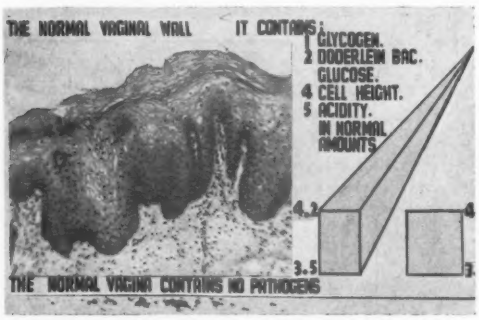


FIG. 5. The left side of the photograph shows the normal vaginal mucosa with vacuolated epithelial cells. The glycogen was present in these epithelial cells but was washed out during staining.

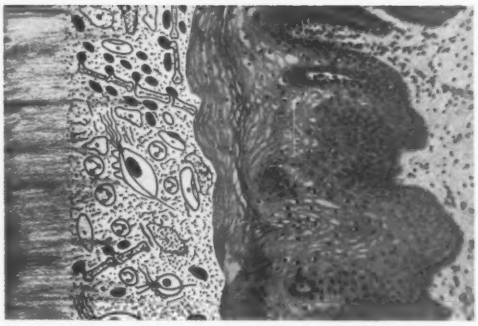


FIG. 4. Shows the presence of the moist layer on the vaginal surface with the pathogens therein. The shaded area above the moist layer represents vaginal douches and medications which contain no spreading agents. The douches and medications do not penetrate down to the vaginal surface due to the presence of this moist layer on the vaginal wall surfaces.

A stained biopsy of the normal vaginal mucosa shows it to be forty-five to eighty-five cell layers in height. Sections of normal vaginal epithelium stained with Best's carmine stain or other glycogen-staining methods show an abundance of glycogen granules in the two upper epithelial layers.

In the mature woman the upper two layers of the vaginal epithelial layer as seen in the ordinary tissue sections stained with hematoxylin are well vacuolated. These vaculoated areas are receptacles for glycogen. Glycogen was present in these vacuolated cells before they were washed out during the staining process. (Fig. 5.)

TABLE III
AVERAGE pH OF 713 CONSECUTIVE VAGINAL pH RECORDINGS IN 163 CONSECUTIVE PATIENTS WITH SOME GYNECOLOGIC COMPLAINT

No. of Patients	No. of pH Recordings	Lowest pH	Highest pH
163	713	3.00	9.1
Average pH			
Posterior Fornix	Anterior Fornix	Left Lateral Wall	Right Lateral Wall
5.244	4.821	4.987	4.902

Average pH for all fornices: 4.988

TABLE IV
AVERAGE pH IN VARIOUS VAGINAL CONDITIONS AS RECORDED IN THE VAGINA*

Conditions	PF	AF	LLW	RLW	Average pH	Times Less Acid Than the Normal Vagina
Trichomonas vaginalis	5.88	5.87	6.03	5.97	5.95	155
Candida albicans	5.49	5.31	5.35	5.29	5.36	96
During menstrual flow	5.85	5.80	5.54	5.60	5.70	300
Senile vaginal mucosa	5.76	5.79	5.66	5.72	5.75	350
Senile vaginitis	6.17	5.98	6.10	6.19	6.14	740
Vagina with associated cervical ectropion (ulcer)	5.41	5.33	5.12	5.10	5.24	84
Vaginal infections during pregnancy	4.80	4.81	4.78	4.71	4.78	38
Acute vaginitis	6.70	6.41	6.43	6.51	6.51	1100
Subacute vaginitis	5.69	5.34	5.53	5.59	5.54	114
Vagina with associated chronic cervicitis	5.64	5.61	5.30	5.43	5.49	119

* Explanation of abbreviations: PF, posterior fornix; AF, anterior fornix; LLW left lateral wall; RLW, right lateral wall.

This glycogen is metabolized from circulating blood glucose. Glucose is metabolized into glucose-1-phosphate; glucose-6-phosphate; fructose-6-phosphate; fructose-1, 6-diphosphate; D-glyceraldehyde-3-phosphate; 1,3-diphospho-D-glycerate; 3-phospho-D-glycerate; 2-phospho-D-glycerate; phosphoenol pyruvate; pyruvic acid; and finally into racemic lactic acid. The extra glycogen is deposited in the vaginal epithelial cells as a reserve supply. The complete breakdown of glucose into lactic acid is made possible by respiratory enzymes, vitamins, coenzymes, activators, receptors, catalysts, Döderlein's bacilli, trace elements and other normal and abnormal vaginal microorganisms. The B-complex vitamins are components of energy-liberating and energy-trapping systems and are necessary for optimum vaginal epithelial glycogen metabolism. The necessary vitamins and/or enzymes, and the steps in the metabolism of glucose are shown in Table II.

The application of Lugol's solution to the normal vaginal mucosa produces a deep brown mahogany color which can be seen grossly (Schiller's test) due to the action of the iodine on the glycogen within the vaginal epithelial cells. If there is a decrease in glycogen, there is a decrease in the intensity of this mahogany color.

In infections or trauma to the vaginal epithelium, as seen in T. vaginalis, C. albicans, in Hemophilus vaginalis and other infections of the vagina, after cauterization, coagulation or conization of the cervix, after repair of cystocele and rectocele and after all vaginal

TABLE V
AVERAGE pH OF FORTY-ONE CONSECUTIVE CANDIDA ALBICANS INFECTIONS

Areas in Vagina	Normal Vagina	Candida albicans	Times Less Acid Than the Normal Vagina
Anterior fornix	3.0–4.2	5.35	195
Posterior fornix	3.0–4.2	5.68	480
Left lateral wall	3.0–4.2	5.42	112
Right lateral wall	3.0–4.2	5.47	107
Average pH of all recorded	5.48		128
Lowest pH	4.01		61
Highest pH	7.91		15,100

TABLE VI
VAGINAL pH IN SIXTY-FIVE CONSECUTIVE TRICHOMONAS VAGINALIS INFESTATIONS

Areas in Vagina	Normal Vagina	Trichomonas Vaginalis	Times Less Acid Than the Normal Vagina
Anterior fornix	3.0–4.2	5.42	120
Posterior fornix	3.0–4.2	5.63	230
Left lateral wall	3.0–4.2	5.72	320
Right lateral wall	3.0–4.2	5.45	105
Average pH	5.54		204
Highest pH	8.50		1600
Lowest pH	4.90		40

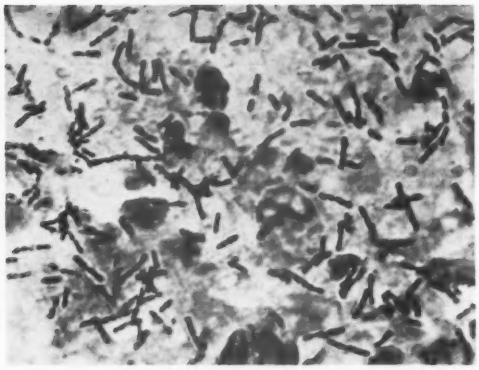


FIG. 6. The normal vaginal Döderlein's bacilli which are present in almost pure culture when the vaginal pH of 1.8 to 2.4 is produced.

operations, there is a decrease or an almost complete loss of glycogen from the vaginal epithelial cells with *less* mahogany color formation. This color test also indicates that less lactic acid will be produced within the vaginal walls. Therefore, vaginal secretion on the vaginal walls will be less acid.

A gram-stained smear from a normal vagina shows many thick, rod-like organisms, and many large clumped vaginal epithelial cells with small nuclei. The epithelial cells stain normally and appear healthy. There may be an occasional pus cell or none at all. (Fig. 6.)

Few, if any, Döderlein's bacilli are seen on a gram-stained smear from an infected vagina whether the infection is due to streptococci, bacillus coli, staphylococci, diptheroids or some other organisms. This also is true after vaginal surgery. One does see many different kinds of microorganisms. It may be said that in an infected vagina there is a mixed vaginal bacterial flora with a definite decrease in the number of, or absence of, Döderlein's bacilli. In the infected vagina, epithelial cells in the vaginal smear are no longer clumped together but are broken up into many small fragments of various sizes and shapes. The more severe the vaginal infection, the more fragmented are the epithelial cells.

One might logically state that in vaginal infections there is a state of abnormality in the following four physiologic factors: (1) hypoacidity, (2) hypoglycogen (glucose), (3) hypoepithelial cellular height and (4) decrease in Döderlein's bacilli. *Hypoacidity or lack of the normal amount of acid is the most important of these four factors.* From these observations, one might conclude that the vagina should be correctly acidified when it is to be treated for an infection, or when a douche is used for medicinal or hygienic purposes.

ACIDITY, ALKALINITY AND MICROORGANISMS

To substantiate some of our findings in previous investigations, twenty cases of acute vaginitis with a profuse, foul discharge were studied. The patients were instructed not to take douches and to omit coitus. Vaginal treatment was suspended for two weeks. External perineal washes with plain water were allowed if leukorrhea caused irritation and/or burning. Aseptic technic was used to collect vaginal secretions from each patient. Each sample was mixed with 0.5 cc. of warm, sterile nutrient broth in a sterile test tube. Smears were made from each of the samples on buffered blood agar with a pH of 2.0, 2.5, 2.8, 2.9, 3.0, 3.1, 3.2, 3.5, 3.8, 4.0, 4.2, 4.4, 4.6, 4.7, 4.8, 5.0, 5.2, 5.4, 5.5, 5.8, 5.9, 6.0, 6.5, 7.0, 7.2, 7.6, 8.0, 8.5 and 9.0. All of the inoculated media were incubated at body temperature and studied twice daily for two weeks.

Results obtained showed that bacterial growths were most abundant at a pH of 7.6 and 8.0. As the pH of the media became more acid, the bacterial growth became less and less abundant. There was no growth at pH 5.5 in two cases, no growth at pH 5.4 in four cases, and no growth below pH 2.9 in all cases. Growths in controls were most abundant at pH 7.6 to 8.0. Staphylococci and colon bacilli did not grow at pH 5.0 or below. T. vaginalis did not grow below pH 4.9. All of these studies are being continued in the Obstetrical and Gynecological Research Institute.

With these facts in mind, it again appears pertinent to suggest that vaginal douches and medications should conform to the normal buffering properties of normal vaginal secretion. It also appears that patients with vaginitis or those who are to douche for hygienic purposes should be advised to use a solution with a pH so low that the resulting vaginal pH will be between 3.0 to 4.2, the normal vaginal range.

After instructing over 10,000 women to douche during their menstrual flow during the past twenty-five years, I have not observed any harm clinically. In six women who were given a vaginal douche (sodium iodide solution) in the x-ray department, the solution was observed by

fluoroscopy during and after its administration, and no untoward effects were observed. The solution was followed by fluoroscopy as the pressure of the sodium iodide was gradually increased to a pressure over 300 mm. Hg. Such enormous pressure could not be produced in the vagina with an ordinary douching apparatus. In this instance a special air-tight douche apparatus was used.

Women who refuse to douche during their menstrual flow or refuse to douche at all should be instructed to instill the new low pH (1.8 to 2.2) powder deep into the vagina once or three times weekly or to insert one of the new low pH 1.8 to 2.2 tablets* once or twice weekly. The day menstruation begins, or the day before, the patient is instructed to instill two to six applicators† full of the low pH powder deep into the vagina until it is full. One to two of the low pH tablets is inserted four times daily into the vagina filled with the soft vaginal powder. If menstrual flow is seen or felt at introitus, two to four applicators full of the powder are instilled deep in the vagina four to eight times daily, or as often as necessary to absorb the menstrual flow. If this amount of powder and tablets does not keep the menstrual flow from reaching the outside of the vagina, the patient places an excess amount of the low acid pH powder between each layer of an external pad. After the external pad is put back in place, an excess amount of the powder is blown or placed between the external pad and the opened labia. As the menstrual flow passes from the vagina and comes in contact with the low pH powder between the labia and the external pad, the blood is changed into fine dried salts which are so fine and light that they will fall off the perineum easily. The new low pH (1.8 to 2.2) buffered medication changes the menstrual blood pH from 7.1 to 7.3 to a pH of 1.8 to 3.0, a pH range in which no pathogenic microorganisms can survive. All menstrual odors are also eliminated.

A NORMAL PHYSIOLOGIC DOUCHE

Massengill Douche Powder®‡ was given as a vaginal douche in the Research Institute with the patient lying on the examining table. The following procedures were performed before the vaginal douche was given: electronic pH recordings, electronic resistivity, electronic variable potentials and electronic pH recording of both lateral walls. These are the most important tests. Fresh and gram-stained smears also were made, and many other tests were done. These tests were performed during and immediately after the vaginal douche.

By testing this douche in the vagina, it has been correctly buffered and correctly acidified to both the normal and abnormal vaginal secretions. It has now been made a normal physiologic douche. Patients here have used this douche powder as many as four times a day, and with extra large amounts of the powder in the solution. No untoward effects have been observed from its use as a vaginal douche.

After superficial cauterization of cervical erosions, it was an ideal douche to prevent slough formation and hemorrhage, and it aided return of the cervical mucosa to normal.

I no longer advocate vinegar and lactic acid douches because they are not buffered to the vaginal secretions. When these two chemicals are given as a vaginal douche, the resulting pH is not of these chemicals but near that of the vaginal secretion present at the time the douche was administered.

Douches may be taken for the following reasons:

1. A douche may be used after coitus if the woman so desires. If she does not wish to douche, or has been instructed not to douche, she may stay in bed after coitus and instill two to four applicators full of the low pH powder and dust the perineum with the same powder. All odors will be eliminated and all secretions on the perineum absorbed.

2. At and during menstruation, in Trichomonas, C. albicans, H. vaginalis and other vaginal infections, these douches may be used if one does not wish their patients to use the new low pH powder and tablets.

3. In acute vaginitis with itching and burning this may be used until the patient can get to a physician for diagnosis and treatment.

4. Two or three weeks after conization, coagulation and cauterization of the cervix these douches may be ordered. This is after the danger of hemorrhage from sloughing has passed.

5. After the patient has been treated for Trichomonas, Monilia, Hemophilus or some

* Trimagill Powder and Tablets, S. E. Massengill, Bristol, Tenn.

† Comatic Vaginal Powder Applicator, Comatic Laboratory, Houston, Texas.

‡ Product of the S. E. Massengill Company, Bristol, Tenn.

other infection of the vagina, she may start taking the douche immediately if itching and burning recur.

6. After seven to twenty-one days of treatment with the new low pH (1.8 to 2.2) vaginal and cervical powder and/or tablets, the patient may use the douche if she does not wish to use the new low pH medication.

7. In cases of vaginal infection, two teaspoonfuls to one tablespoonful of this douche powder in one quart of water is used in the interim between menstrual flows. During the menstrual flow two to four tablespoonfuls in two quarts of water are used three to six times (or more) a day. This is to be done for at least three months to prevent recurrence of the vaginal infection. If there is no reinfection in three months, the vagina usually remains normal.

SUMMARY

From these studies one might conclude that alkaline or weak acid (hypoacidity) douches are contraindicated because there is a resulting hypoacidity and alkalinization (the pH approaching the alkaline side of the pH scale) when there are pathologic changes in the vagina.

The correct amount of buffer as well as the correct amount of surface-acting agents (exploding agents), vaginal adhesives and correct pH must be determined by direct studies of the medication in the vagina in the presence of the pathologic secretions, pathogenic microorganisms and all the pathologic changes found within the vaginal walls. This test must not be done in test tubes. The action of the douche presented herein has been studied in the infected vagina over 1,000 times. Most alkaline douches favor the growth of pathogenic vaginal microorganisms.

Patients with leukorrhea or vaginal soreness should be instructed at first to use one to two tablespoonfuls of this douche powder in her douche bag until she can get to her physician. One tablespoonful of the powder is used for an ordinary cleansing douche. The patient is instructed to lie down in the bath tub and to hold the lips of the vagina against the nozzle in order that the vagina be distended. The solution should be retained for five to ten minutes or longer, and warm water should be used. The douche can or bag should be hung or set as high as the present day commode tank which is two to three feet high.

Even in cases of sterility, soda alkaline douches are contraindicated. No vaginal douche with a pH of 3.0 or higher is advocated.

Most women still douche and will continue to douche, even if the physician instructs her not to douche, if they feel that their vagina is not clean. A woman cannot hurt her vagina by using a normal physiologic douche even if she uses it four to eight times daily. If a woman wishes to douche, let her douche, because it produces in her mind the same psychologic feeling as one obtains from bathing or brushing one's teeth.

A correctly acidified and correctly buffered, normal physiologic douche powder has been presented.

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Surgical Implications of the Roentgenographic Demonstration of Rokitansky-Aschoff Sinuses in the Gallbladder

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Reports of the demonstration of Rokitansky-Aschoff sinuses by cholecystography have recently appeared in the literature. These reports and the successful demonstration of such sinuses in five patients by one of the authors stimulated our interest in the surgical implication of these findings. It is our belief that the cholecystographic visualization of these sinuses is evidence of chronic cholecystitis with or without stones and an indication for cholecystectomy.

Rokitansky [*29*], in 1842, described the presence of gland-like sinuses in the wall of the gallbladder. These usually extended through the wall to the serosa and varied in size, depth and number. He noted that these sinuses often contained small stones. Similar findings were later described by Aschoff. In 1858, Luschka [*18*] described certain glands in the wall of the gallbladder often referred to now as Luschka's crypts or sinuses. In 1869 he said that these glands, however, never opened into the gallbladder lumen as do the sinuses of Rokitansky [*29*]. Courvoisier [*5*], in 1890, reported twenty-eight gallbladders which contained what he called "special diverticula." Eighteen of these diverticula contained calculi. Careful and detailed morphologic studies of the gallbladder by Halpert [*9,10*] served to show that the sinuses of Rokitansky and Aschoff and the glands or crypts of Luschka were separate entities. These sinuses have been given numerous names by later investigators. Diverticula of the gallbladder, cholecystitis glandularis, intramural diverticulosis of the gallbladder and cholecystitis glandularis proliferans have been some of the terms used. It would seem simpler to use either the term diverticula or Rokitansky-Aschoff sinuses.

Pathologists have, for many years, reported the presence of these sinuses in the microscopic examination of the gallbladder wall. It has been only recently that their presence has been shown to be of greater frequency in the chronically diseased gallbladder. Rokitansky and Aschoff held this belief, as well as the opinion that the sinuses were a part of the etiology of gallstones.

CASE REPORTS

Brief reports of five patients in whom these sinuses were demonstrated by cholecystography are herein presented.

Case 1. J. G., a fifty-eight year old white man, was admitted to Misericordia Hospital on November 29, 1954, complaining of severe pain in the abdomen. Because of repeated episodes of hemorrhage from a duodenal ulcer present for the previous seventeen years, subtotal gastrectomy was performed in March 1953. In July 1953, an incisional hernia was repaired. In August 1954, the patient noticed gagging and nausea when moving from the supine to the upright position. This almost always occurred in the morning upon rising and lasted five to ten minutes. It was relieved by vomiting of bile which was occasionally tinged with blood. These attacks occurred three or four times a week. Two days prior to admission, the patient noted the onset of severe pain beneath the right costal margin accompanied by fever. This lasted five hours and was relieved only by injection of opiates. His fever increased the next day. Tenderness persisted in the right upper quadrant of the abdomen and the patient began to have chills.

On admission temperature was 98.6°F., pulse 100 per minute, respirations 20 and blood pressure

140/100 mm. Hg. The patient was a slightly obese man. There was no jaundice. The positive physical findings were limited to the abdomen. There was a midline abdominal scar. The liver was palpable one fingerbreadth below the right costal margin. There was some deep tenderness in the right upper quadrant of the abdomen, but no rigidity and peristalsis was active.

Roentgenographic study showed a normal functioning gastroenterostomy. Cholecystography showed a faintly outlined gallbladder shadow with multiple tiny nonopaque stones seen. There was a double ring density in the wall of the gallbladder indicating enlargement of the Rokitansky-Aschoff sinuses.

Abdominal exploration on December 15, 1954, revealed numerous adhesions between the transverse colon and the omentum and the anterior abdominal wall. The gallbladder was an average normal size, but its walls were thickened. Stones could not be palpated in it. The gastroenterostomy was in good condition. Cholecystectomy was performed.

The pathologic examination of the specimen showed the wall thickened with marked inflammatory cell infiltration in it. Several tiny stones were present.

The patient's postoperative course was complicated by paralytic ileus and a wound separation. The wound healed, however, and he was discharged on the twenty-fourth postoperative day. In November 1956, the patient was readmitted for repair of an incisional hernia. There has been no recurrence of his previous complaints.

Case II. C. S., a twenty-six year old white woman, was admitted to Misericordia Hospital on March 18, 1957, with a chief complaint of abdominal pain of four years' duration. The patient had been in good health until four years prior to admission when she noted episodes of pain in the epigastrium and the lower part of the chest, beginning after the birth of her first child. The attacks usually occurred shortly after meals, especially when these meals contained fat. The pain was usually localized in the epigastrium and sometimes radiated to the back. The attacks of pain increased in frequency and severity with each of her five pregnancies. Usually, the attacks lasted one hour, but with her most recent pregnancy, she had an attack which lasted several hours. Occasionally, she was awakened at night by this pain. She never had jaundice, nausea or vomiting and her stools were normal. She lost 10 pounds during a period of several months prior to admission.

Physical examination showed slight tenderness on deep palpation in the upper half of the epigastrium. There was no jaundice. There were no other abnormal findings in the abdomen.

Cholecystography showed a distinct gallbladder shadow on the fourteen hour films, slightly less dense than average normal. Following the ingestion of the fatty meal, the gallbladder contracted fairly well. Each of the films showed one large radiolucent calculus, 2½ cm. in diameter, and several 4 to 5 mm. radiolucent calculi adjacent to it. Several of the smaller calculi were located in accumulations of the contrast medium beyond the normal lumen of the gallbladder in its fundal area indicating that they were within Rokitansky-Aschoff sinuses. There was a slight constriction in the proximal third of the gallbladder. (Fig. 1.)

Abdominal exploration showed the gallbladder to be of average normal size. Its walls were considerably thickened and fibrosed throughout. One large stone and several small stones were found within the gallbladder along with numerous cholesterol crystals and white bile. (Figs. 2 and 3.) The remainder of the abdominal exploration was normal. Cholecystectomy was performed. The patient's postoperative course was without complications and she was discharged on the tenth postoperative day. She has remained asymptomatic since that time.

Case III. J. F., a forty-four year old white man, was admitted to Misericordia Hospital on May 1, 1955, with a chief complaint of pain in the chest, arms and back. An electrocardiogram on this first admission showed an acute posterior myocardial infarction. The patient recovered without complications and was discharged three weeks later.

He was readmitted on January 17, 1956, complaining of pain in the lower portion of the chest and in the upper part of the abdomen which began the evening of admission. This pain did not radiate to the arms or back. An electrocardiogram again showed evidence of an acute infarction. During the course of medical management of this patient, more pain developed in the right upper quadrant. Physical examination revealed tenderness in the region of the gallbladder.

Cholecystography showed only a faint gallbladder shadow on two occasions during this admission and no stones were seen. The patient was treated medically; he improved and was discharged on February 29, 1956.

Because of recurrent upper abdominal pain, he was readmitted on May 1, 1956. Cholecystography showed a vague gallbladder shadow with an opaque rim around the fundus, indicating enlargement of the Rokitansky-Aschoff sinuses.

Cholecystectomy was performed on May 4, 1956. The gallbladder was found to be thickened and contained many tiny calculi, one of which was impacted in the cystic duct area. Pathologic examination of the gallbladder showed marked thickening of the wall. The mucosa was almost completely

FIG. 1. Roentgenogram of gallbladder in Case II. Note constriction of proximal gallbladder, large calculus and several dilated Rokitansky-Aschoff sinuses in fundus.

FIG. 2. Photograph of specimen from Case II showing features demonstrated in roentgenogram in Figure 1.

eroded. The wall was infiltrated by inflammatory cells. In the thickened wall, there were small cyst-like spaces filled with amorphous debris. The cells at the periphery of the cysts resembled liver cells. The patient's postoperative course was without complications and he was discharged one month after the operation. He has had no recurrence of symptoms.

CASE IV. B. F., a forty-one year old white man, was admitted to Misericordia Hospital on November 7, 1957, with a chief complaint of weakness. One year prior to admission, gastrointestinal

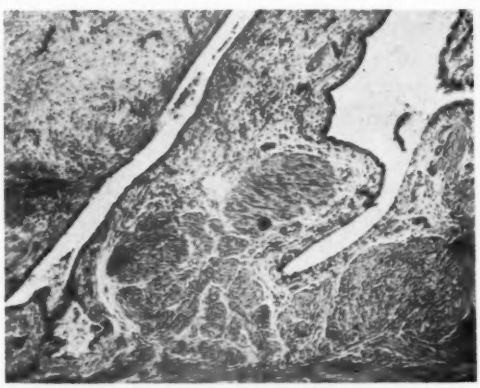
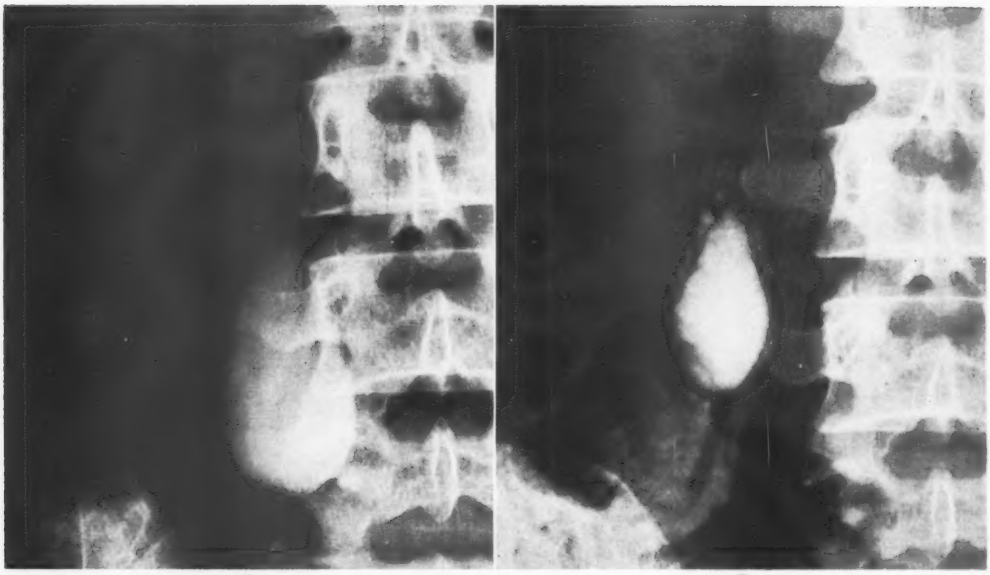


FIG. 3. Photomicrograph of gallbladder wall in Case II showing dilated Rokitansky-Aschoff sinuses.

FIG. 4. Roentgenographic demonstration of Rokitansky-Aschoff sinuses and constriction of gallbladder in Case IV.



A B

FIG. 5. A, cholecystogram of Case v before a meal rich in fat. B, cholecystogram of Case v after fatty meal showing typical halo of bead-like Rokitansky-Aschoff sinuses.

studies revealed a duodenal ulcer. With diet and medication, his symptoms disappeared. One and a half weeks prior to admission, he fainted.

On admission, his blood pressure was 172/112 mm. Hg and his pulse was 90 per minute. Physical examination was otherwise entirely within normal limits.

Cholecystography showed a normal gallbladder shadow on the fourteen hour films, and no stones were seen. Films taken after the ingestion of the fatty meal demonstrated a distinct halo-like shadow involving the upper four-fifths of the gallbladder shadow, about 4 mm. deep. It was due to multiple diverticula in the gallbladder wall. (Fig. 4.) Roentgenogram of the chest and intravenous urography showed no abnormalities. An upper gastrointestinal series showed an irregular duodenal bulb, believed to indicate a chronic duodenal ulcer.

The patient was discharged without operative intervention. At the present time, this patient appears to be symptomatically well.

CASE V. E. B., a forty-one year old white woman, was admitted to Misericordia Hospital on June 27, 1956, with symptoms primarily referable to the urinary system. Because of flatulence and indigestion following the ingestion of fatty food, cholecystography was performed. Fourteen hours following an oral dose of 3 gm. of Teridax,® a dense gallbladder shadow with no evidence of calculi was demonstrated. The medium was well concentrated. Films taken following a fatty meal showed good contraction of the gallbladder. A large number of rounded bead-like collections of the contrast medium were seen surrounding the contracted gallbladder shadow. (Figs. 5A and B.) Intravenous urography, roentgenographic studies of the entire gastrointestinal tract and cystoscopy revealed no abnormalities.

The patient was discharged without definitive treatment. This patient has not been operated on to this date and still has symptoms and signs of gallbladder disease.

ROENTGENOGRAPHIC ASPECTS

Rokitansky-Aschoff sinuses in the gallbladder have been familiar to the pathologist since 1842.

Graham and Cole pioneered cholecystography in 1924. Innumerable oral cholecystograms have been performed all over the world since then. It was not until 1948 that March [*19*] first described the roentgenographic visualization of Rokitansky-Aschoff sinuses. Since that time approximately thirty-eight patients with such roentgenographic findings have been reported, mainly in the radiologic literature [*1,2,4–7,11,12,14–18,20–29*].

It is significant, we believe, that during this later period denser media for cholecystography were introduced. Good [8], in a recent editorial, compared cholecystography at the present time, as reported by Baker and Hodgson [3] from the same clinic, to that of the past. He points out that poor function was noted in 5 per cent of the 1932 series and of these, 94.8 per cent were found at surgery to be diseased gallbladders. In the 1955 series, poorly functioning gallbladders were not noted and a number of gallbladders were visualized and stones were seen that would not have been seen in 1932. He also correctly warns that this does not necessarily increase the accuracy of cholecystography since nonvisualized and poorly functioning gallbladders were always considered diseased.

It is our belief that the reason for the sudden emergence of Rokitansky-Aschoff sinuses as a radiologic entity is the use of denser contrast media enabling us to obtain a better picture of the internal architecture of diseased gallbladders. Prior to ten years ago, these would have been in the nonvisualized or poorly functioning class. We further believe that roentgenographic demonstration of these sinuses is reliable evidence of biliary tract disease even in the presence of a dense gallbladder shadow without visible calculi. These diverticula are visualized on the roentgenogram as small bead-like or slit-like collections of the contrast medium beyond the normal lumen of the gallbladder and their necks are not normally visualized.

In over two-thirds of the cases reported in the literature, a stenosis of the proximal gallbladder was also demonstrated in gallbladders which contained roentgenographically demonstrable Rokitansky-Aschoff sinuses.

Some authors believe that this stenosis of the proximal gallbladder is one of the most important etiologic factors in the cholecystographic demonstration of Rokitansky-Aschoff sinuses. Pathologically, the stenosis has been found by some authors to be due to hyperplasia of all the gallbladder wall structures, and some think that it may be of congenital origin. Apparently, these sinuses dilate in conditions in which a partial obstruction of the proximal gallbladder or cystic duct area is present. Culver, Berens and Bean found stenosis or constriction in all but five of the cases reported until the time of their paper [6]. A review of later cases would substantiate a similar proportion of three cases of the presence of constriction to one without constriction. In only a small number of patients were stones visible on x-ray film. In one of our patients, there was a constriction of the proximal gallbladder, and in the other two operative cases there was a stone impacted in the cystic duct with partial obstruction. In the two nonoperative cases, neither stones nor constriction of the gallbladder was demonstrable roentgenographically.

In most reported cases, a relatively dense gallbladder shadow has been demonstrated, indicating that the gallbladder retains its concentrating power to some degree. This does not necessarily mean a normal concentrating power since, as indicated previously, the introduction of denser contrast media enables us to visualize more gallbladders today than were visualized twenty years ago. This increased incidence of gallbladder opacification is due to the molecular pattern of the contrast media itself, and some functionless gallbladders are opacified because of the mere presence of the media in the bile. In our group of patients, a faint shadow was seen in three cases and a dense shadow in two.

In the operative cases, the gallbladder did not contract following the ingestion of a meal rich in fat and the Rokitansky-Aschoff sinuses were seen in all films taken. In our nonoperative cases, the gallbladder contracted after the fatty meal and the Rokitansky-Aschoff sinuses were seen only on the films taken after the fatty meal. In most cases in the literature, these sinuses are seen either better or only after the fat rich meal. These cases would have been missed if the fatty meal had been omitted as advocated by some investigators today.

SURGICAL CONSIDERATIONS

Robertson and Ferguson [22], in an investigation of this entity, studied 495 gallbladders, of which 175 had been removed at autopsy and 320 at operation. Of the gallbladders removed post mortem, 58 per cent did not show Rokitansky-Aschoff sinuses. Of thirty-three gallbladders with evidence of previous inflammation removed at autopsy, only four, or 12 per cent, were free of sinuses and twenty-nine, or 88 per cent, revealed sinuses of various grades. Of the 320 gallbladders surgically removed, only twenty-three, or 7 per cent, were without sinuses or, as these authors prefer to call them,

diverticula. These investigators found bile pigment, cholesterol crystals and biliary calculi in the diverticula, but did not believe that gallstones caused the formation of the sinuses. It was their opinion that increased intracystic pressures, the absence of mucosa muscularis and the independent response of the muscle bundles to physiologic stimuli were the important causative factors. Twelve patients showing this finding, four from autopsy records and eight studied clinically, were investigated by LeQuesne and Ranger [*17*]. Less than half the patients had associated gallstones, but all gallbladders showed moderate to marked inflammatory change. This was likewise true of most of the reported cases demonstrated radiographically and removed surgically. In some of these, the gallbladder wall was found to vary in thickness from 0.5 to 1.5 cm. Much discussion centers about the constriction ring which is seen both in the roentgenogram and in the pathologic specimen. Some investigators believe it aids in the cause of the sinuses while others believe it to be congenital (Robinson and Peters [*13*] and March [*19*]). Culver, Berens and Bean [*6*] believe that the presence of stenosis is a most important factor in the roentgenographic demonstration of sinuses. There are, however, a number of reports of such demonstration without the presence of the constriction. Ross, Finby and Evans [*25*] thought that constriction aids in the development of the sinuses.

It may be deduced from the previous information that the roentgenographic demonstration of Rokitansky-Aschoff sinuses, or diverticula as some prefer to call them, is becoming more frequent. Furthermore, its future roentgenographic demonstration in greater numbers seems most likely. Pathologic examination shows definite inflammatory change and chronic cholecystitis. In a good percentage of the cases, however, gallstones are not found.

SUMMARY

1. Five new cases of roentgenographic visualization of the Rokitansky-Aschoff sinuses are reported.

2. Cholecystographic visualization of Rokitansky-Aschoff sinuses has been reported with increasing frequency in the last ten years. The introduction of dense contrast media during this same period may account for the sudden emergence of Rokitansky-Aschoff sinuses as a roentgenographic entity.

3. Visualization of these sinuses is considered to be a reliable sign of cholecystic disease and has been found to be associated with stenosis of the proximal gallbladder in over two-thirds of the patients, with calculi and partial obstruction of the cystic duct in others.

4. Surgical removal of such gallbladders has been followed by complete relief of the patient's symptoms.

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Colonic and Anorectal Function and Disease

PART I

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THE present review is primarily a continuation of those which appeared periodically in *Surgery, Gynecology and Obstetrics* since 1943. These reviews and our comprehensive multiauthor textbook [1] have a common aim, namely, to concentrate a great deal of recent, pertinent and useful information in one place. The main object has been to elucidate the underlying background for the advances and retreats in the field of coloproctology and to present the new and important facts.

This review, in common with the antecedent reviews, is based largely, though not exclusively, on the papers that were published in English in foreign and American periodicals that appeared during the past two years including the first half of 1960. Also the bulk of all of the important and best papers herein reviewed stem from journals devoted primarily to general surgery. This review is directed to the surgeon who does not have access to large surgical centers.

EMBRYOLOGY

Snyder [2,3] has presented the embryology of the colon and rectum with the aid of three-dimensional diagrams.

Anomalies. Congenital absence [4] and duplication [5] of parts of the colon have been discussed. For right sided retrocolic fixation of redundant sigmoid colon simple surgical reposition is advised in the absence of associated disease [6]. Bill [7] believes that failure of complete migration of the anorectal opening is probably the cause of imperforate anus in the majority of instances. The anatomy of the pelvic autonomic nervous system in imperforate anus has been well described and illustrated [8]. The treatment has been ably presented [9–11].

Segmental dilatation of the colon, a congenital lesion not previously reported, is described as a segmental fusiform dilatation of the large intestine [12]. Clinically, this condition resembles Hirschsprung's disease. It probably represents a defect in motility of the dilated portion of the colon and responds to segmental resection. Microscopically, the neuronal elements in both myenteric and submucosal plexuses are well formed. It is wise to determine the presence of ganglion cells by rapid section before or during operation.

Morgenstern [13] illustrated and described the positional anomaly of the descending colon as observed in three patients. Failure of fusion of the left mesocolon with the posterior wall of the abdomen during embryonic development results in the development of this rare unilateral anomaly. Clinically, behind a persistent mesocolon a segment of the small intestine may insinuate itself and become incarcerated, producing a characteristic roentgenologic picture and leading to surgical intervention for correction of this embryologic defect.

ANATOMY AND PHYSIOLOGY

Goligher [14] has recently restated his basic work on the anatomy of the anorectum and colon and corrected several time-honored misconceptions, especially with regard to anatomy of the sphincteric musculature as described by Milligan and Morgan. These tenets or concepts have been confirmed by others [15–17].

According to Griffiths the differences in the mode of division of the inferior mesenteric artery are numerous, but most are referable to a common pattern with two main variations and four less common patterns. The inferior mesenteric artery arises from the abdominal aorta about one and one-half to two inches (4 to 5 cm.) above the bifurcation of the abdominal aorta. Its stem makes an angle of

30 degrees with the aorta and gives off its first branch, the left colic artery, usually one to one and one-half inches (2.5 to 3 cm.) from its origin, which ascends toward the splenic flexure. In 89 per cent the left colic artery did not divide until within two inches (5 cm.) of the splenic flexure. In 25 per cent this artery gave off a small branch which joined the marginal artery of the descending colon.

The sigmoid arteries have two modes of origin: In 36 per cent they originated from the inferior mesenteric artery and in 30 per cent the first sigmoid artery arose from the left colic artery. The sigmoid vessels are defined as those, irrespective of their precise origin, which traveled for some part at least of their course in the sigmoid mesocolon. An extramesocolic vessel running to the descending colon should be called accessory left colic artery. The left colic artery is absent in 6 per cent but in these cases the first sigmoid artery was always a large vessel. There is great variability in the mode of division of the sigmoid arteries.

The marginal artery, first described by von Haller in 1786 and redescribed by Drummond in 1913, is defined as the artery from which the vasa recti arise. This marginal artery is supplied with blood by branches of the inferior and superior mesenteric arteries, hence forms a significant anastomosis between them. It was constant and well developed in all specimens examined, in conformity with the findings of all past investigators. Griffiths' injection experiments have shown that the anastomosis between the superior rectal artery and the last sigmoid artery is always adequate hence Sudeck's "critical point" is devoid of surgical or anatomic significance.

However, a real critical point exists at the splenic flexure where the marginal artery is often small in caliber. The left colic artery usually divides about two inches (5 cm.) from the bowel as it approaches the splenic flexure. The left branch passes to the distal loop of the flexure, while the right branch goes to the transverse colon, affecting an anastomosis with the left branch of the middle colic artery. This terminal form of the left colic artery should always be preserved after ligation of the inferior mesenteric artery at its origin, since it forms a secondary marginal artery; otherwise the distal colon is dependent solely on the fine marginal artery of the splenic flexure.

The anastomosis between the middle rectal and superior rectal arteries provides an adequate collateral circulation in cases of aortic block. This anastomosis is decidedly capable of supplying blood to the whole of the sigmoid and to most of the descending segments of the colon.

The marginal artery lies one to one and one-half inches (2.5 to 4 cm.) from the medial aspect of the colon; it is very difficult indeed to identify this vessel in the obese patient. The vasa recti should not be divided as there is a precarious or very little anastomosis between these small arteries. Damage to these vessels or separation of the colon from the marginal artery are responsible for gangrene. Temporary transverse colon colostomy should be placed well to the right of the midline to avoid damage to the left branch of the middle colic artery.

The absence of the middle colic artery in 22 per cent of cases calls for special cautions. The patterns of the colic arteries originating from the superior mesenteric artery are unusually well described by Sonneland and associates [*18*].

An article primarily of academic interest to the pathologist rather than of practical significance to the surgeon is one by Walls [*19*] on the histology of the human anal canal.

Brossy [*15*] has briefly reviewed the physiology of defecation and the role of the sphincteric anal musculature. An investigation by Karlan et al. [*20*] appears to show that the muscularis of the rectum constitutes an adequate source of sensory receptors to initiate the normal rectoanal reflexes. Sphincter continence can be retained by preserving a rectal cuff of muscularis and the anal sphincter musculature. Reference to a review of the recent concepts of the mechanism, especially those concerning the importance of the sensory nerve supply to the rectal wall, the motor supply to the external sphincter musculature and emphasis on reduction of the fecal bulk by water absorption [*21*], is included here primarily for emphasis because of this misunderstood physiologic mechanism.

SIGMOIDOSCOPY

Statements that "sigmoidoscopy is every clinician's business" and that "sigmoidoscopy does not require a proctologist" have drawn a sharp rebuke from a number of proctologists [*22*].

In routine sigmoidoscopy the problem is to determine what distance of the terminal por-

tion of the colon should be examined. In 50 per cent of patients sigmoidoscopy offers little, if any, difficulty. In about 10 per cent of patients there is an unyielding angulation of the bowel at about the level of 15 cm. from the anal verge. Mild angulation of the bowel to the right or left side exists in another 30 to 40 per cent of patients which can be overcome by gentle manipulation.

It is best to avoid enemas prior to endoscopy in order to retain the mucosa unaltered. This is particularly true of concentrated enemas. Over 65 per cent of the reviewer's patients are successfully sigmoidoscoped without preliminary enemas.

The technic of sigmoidoscopy has been described and illustrated [*23*]; another teaching instrument for proctosigmoidoscopy has been described [*24*]. A new suction lavage sigmoidoscope has been developed [*25*]; and by the time this review appears in print, it is possible that the new flexible fiber optic coloscope for the examination of the entire colon via the anus will be available for investigational and clinical use [*26*].

BIOPSY

Biopsy for localized disease, especially that of the rectum, using a cold biopsy forceps is common current practice. All suspicious, accessible intestinal lesions as well as grossly apparent malignancies should be examined histologically before definitive treatment is instituted. Permanent or paraffin section diagnosis is always preferred to frozen section technic; this is especially true in adenomas as discussed in the section on polyps [*27*].

The indications for and the limitations of frozen section diagnosis have recently been discussed [*28*]. In general, there is a rare indication for frozen section diagnosis of intramural or intraluminal intestinal lesions. Bizarre-appearing lesions such as endometriosis at times have to be distinguished from cancer. The value of frozen section diagnosis in adenomas has been discussed in the section on polyps. In pedunculated adenomas frozen section of only the pedicle is indicated, because a cancer-free pedicle is a good guarantee against local spread or recurrence although it is no guarantee against distant metastases. Frozen section diagnosis is valuable in megacolon for the establishment of the presence or absence of ganglion cells.

The diagnostic possibilities of suction biopsy of the colon (and other segments of the alimentary tract) have recently been explored [*29*]. Suction biopsy is of little use in highly localized disease, but it is of diagnostic value in diffuse intestinal lesions, such as ulcerative colitis. This procedure is not only a useful investigative tool but also has clinical value. The instrument is easily handled and adaptable to use through the endoscope for obtaining mucosal samples beyond the reach of the conventional sigmoidoscope. Suction biopsy has proved valuable not only in the diagnosis of ulcerative colitis, occult or apparent, but also in schistosomiasis and is said to have ancillary value in detecting amebiasis.

ROENTGENOGRAPHY

Wolf and associates [*30*] explored in detail the possibilities of recognizing intrinsic lesions of the gastrointestinal tract without opacification, that is, by the utilization of the "gas shadows" seen on routine films of the abdomen. The lesions discussed are not those that have caused obvious obstruction or perforation but rather the common conditions ordinarily demonstrated in the course of a barium meal or a barium enema. There is no doubt after reading this monograph [*30*] that a large amount of information is available on survey of simple films. The authors themselves apparently were surprised by a retrospective study of such films after the lesions had been found by conventional means. They point out that there are sound physiologic reasons why positive findings may be anticipated in a substantial number of cases. Under normal circumstances, a gas collection in the bowel is under greater pressure than the gas dissolved in the tissue and in the blood and as a result will be completely absorbed. On the other hand, if the wall of the bowel is functionally disturbed as a result of an infiltrating lesion, gas is likely to persist in the involved segment since the wall cannot contract. Each viscus has a characteristic location, configuration and surface pattern which vary normally within a limited range. It is pointed out that this is also true of the caliber of any portion of the gastrointestinal tract. Under physiologic conditions there is a critical opening or closing pressure below which a muscular viscus will collapse completely. Therefore, a caliber less than that corresponding to the critical pressure cannot persist normally. As a result, "narrowed segments" are not physiologic but

pathologic. The bases for the recognition of filling defects and of discrete ulcerations are self evident.

After an introductory chapter on general principles, specific consideration is given to lesions of the stomach, small bowel and the colon. The various types of benign and malignant tumors are illustrated and the changes which are ordinarily demonstrated by barium are shown to be clearly evident with retained gas. Examples of benign ulceration of the stomach, inflammatory and vascular disease of the small bowel and colon, diverticulosis, diverticulitis and many miscellaneous conditions are clearly illustrated. Special consideration is given to the findings in ulcerative colitis. Of interest is the clear-cut demonstration of the functional nature of the haustral pattern of the colon under normal conditions and in diseased states.

The use of gastrografin, an organic iodide in an aqueous solution, has been advocated instead of barium sulfate for x-ray examination of the alimentary tract when prolonged retention within fistulas, body cavities or the lumen of the intestine is anticipated [*31*]. The contrast medium is palatable and has no toxic effects. The contraindications are iodine sensitivity, acute appendicitis and complete intestinal obstruction.

ANTIBIOTICS

There has been a galaxy of papers dealing with the various phases of antibiotic agents.

Preoperative Preparation of the Gut. A critical appraisal of this problem was furnished by Dearing [*32*], Cohn [*33*], Turell and Landau [*34*] and others who advocated the use of neomycin alone or in combination with another antibiotic or sulfonamide drug. Tyson and Spaulding [*35*], on the other hand, have decided to abandon the use of antibacterial agents in uncomplicated cases. Cohn [*33*], has a result of clinical and experimental studies of 200 cases, believes that a high concentration of antibiotic agents must be formed and maintained intraluminally before, during and after operation upon the colon. No instances of pseudomembranous enterocolitis have been observed by Cohn. Postoperative complications were not, as expected, completely eliminated. Also, antibiotic therapy is not intended as a replacement of sound surgical judgment and principles.

However, the possible effect of the control of colonic bacterial flora on the dissemination of cancer cells at the anastomotic suture line and the development of metastases from colonic tumors demands an "agonizing reappraisal" of the safety of the use of antibiotics and other intestinal antiseptic agents, including Clorpactin [*36*].

Studies on the postoperative prophylactic use of antibiotics has convinced Barnes et al. [*37*] that these agents do not diminish the incidence of postoperative infection and that such practices may predispose to the emergence of resistant strains of bacteria. Studies by Sanchez-Ubeda et al. have yielded similar results [*38*]. The danger of the indiscriminate routine employment of antibiotic prophylaxis in elective surgery is particularly well discussed by Pulaski [*39*].

The important intestinal complications of broad spectrum antibiotics are: (1) simple postoperative diarrhea with or without concomitant anal pruritus; (2) micrococcal enteritis and (3) pseudomembranous enterocolitis [*34*]. Micrococcic enteritis and pseudomembranous enterocolitis may, however, coexist, and on rare occasions may be accompanied by pseudomembranous involvement of the respiratory tract. It should, however, be pointed out that pseudomembranous enterocolitis is not a new phenomenon. It is a syndrome of many opinions with but few proved facts. Its occurrence was recorded by Finney as far back as 1893, long before the discovery of antibiotics. Today, as in the past, pseudomembranous enterocolitis has followed operations as well as nonoperative medical conditions in which no relation to antibiotics could be established [*34*].

In a series of important experiments, Prohaska et al. [*40–42*] induced pseudomembranous enterocolitis with Staphylococcus aureus and its enterotoxin. Fatal enterocolitis was induced in antibiotic-treated chinchillas [*40*] by the oral administration of certain strains of staphylococci. Fatal enterocolitis was induced in normal chinchillas by the oral administration of staphylococcal enterotoxin. Staphylococcus isolated in pure culture from known cases of pseudomembranous enterocolitis or from cases of food poisoning reproduce the disease in chinchillas with demonstrable gross and histologic changes compatible with enterocolitis. Nonfatal enteritis was also induced in normal cats and kittens by the oral administration of staphylococcal enterotoxin.

As a result of his numerous studies, Prohaska believes that pseudomembranous enterocolitis develops in man when colonies of staphylococci are able to grow in his intestine and elaborate enterotoxins. The train of clinical events that leads to the fatal issue is due to the enterotoxin elaborated by particular strains of staphylococci.

For emphasis it should be stressed, however, that since pseudomembranous enteritis may occur without any culturable Staphylococcus aureus in the bowel, it is questioned whether all cases of this condition are due to the staphylococcus in the gut [43].

Pseudomembranous enterocolitis, in contrast to micrococcal enteritis, does not always yield readily to therapy. A novel but very simple adjunctive form of therapy, namely, a retention fecal enema, was proposed by Eiseman et al. [44]. He administered retention enemas composed of normal feces suspended in sodium chloride solution in an attempt to reestablish the normal intestinal flora. Cultures of the feces of all of his treated patients yielded Staphylococcus pyogenes var. aureus before this form of treatment was begun. This therapy is based on the known fact that staphylococcal overgrowth occurs when other microoganisms disappear and that reintroduction of the bacteria, viruses and bacteriophage, normally found in the large intestine, might reestablish the balance of flora with subsidence of staphylococcal predominance and the resulting symptoms. In each of Eiseman's four patients, the clinical course was markedly improved and the Staphylococcus pyogenes var. aureus which grew in pure culture before therapy disappeared from the feces and was replaced with normal colonic nonpathogenic organisms after this therapy. This clinical experience could not be reproduced in two dogs. The clinical value of this rational therapeutic method has been confirmed (without mention of Eiseman's work) by Cutolo et al. [45] who introduced 50 cc. of fresh human feces into the small bowel via a Cantor tube along with enemas of human feces. Yogurt and lactobacilli acidophilus (Lactinex) tablets (usually of questionable value [34]) were used concomitently.

New Drugs. Cohn [46] has evaluated Kanamycin, a new broad-spectrum antibiotic isolated from cultures of Streptomyces kanamyceticus, on a bacteriologic basis as an agent for intestinal antisepsis. Absorption from the intestinal tract is practically negligible. My own studies show that the effect of this new antibiotic agent on colonic microflora is essentially the same as that of neomycin, hence my adherence to the latter agent.

A new, sparsely absorbable antibiotic, paromomycin (Humatin) has been proposed for the treatment of a variety of intestinal infections, intestinal amebiasis and for the preoperative preparation of the colon. To date, pertinent side effects have not been noted, probably because this antibiotic agent has not yet received considerable clinical trial.

Side Effects. Declomycin® (demethylchlortetracycline) is a recently introduced broad-spectrum antibiotic and is produced by a mutant strain of Streptomyces aurefaciens. Chemically it is closely related to the other known tetracyclines. Photosensitivity due to this new antibiotic has been reported [47,48].

Chloramphenicol (Chloromycetin®). In the past, the reviewer has used this antibiotic only in instances which have not responded or were not likely to respond to safer antibiotic agents, when the disease processes justified the calculated risk of serious toxic reactions or in the case of typhoid fever. Chloramphenicol is a nitrophenol compound and is known to cause granulocytopenia, agranulocytosis and fatal aplastic anemia. The myelotoxicity, believed to be due to its nitrozene radical, may be extremely serious. The hematopoeitic issue should be observed frequently and carefully whenever this antibiotic is given [49]. This has recently been confirmed by the Council on Drugs of the American Medical Association stating "that there is no longer a reasonable doubt that chloramphenicol may cause aplastic anemia" [50]. Altafur® has also been found to possess serious toxic side effects that warrant the discontinuance of the use of this drug altogether, at least for the time being.

POLYPS

Adenomas: Cancer Potential. The question of metamorphic forces or transition from adenoma to cancer has been studied in various ways and has remained debatable to date. The prevailing, perhaps erroneous, opinion is that adenomas may undergo malignant transformation. This belief is based largely on circumstantial evidence.

The confusion is understandable because at one extreme there is the published guess, prac-

tically impossible to verify scientifically, that "all polyps of the colon are cancers (carcinomas) or will become cancers if they are not destroyed and if the patient lives long enough. At the other extreme is the belief, based on a clinical study, that adenomas are either malignant initially or tend to become malignant very early and that they do not become malignant over the course of time.

The reviewer has observed the occurrence of cancer in the site of benign adenomas in four patients after a lapse of about three to four years. These observations are, however, not considered conclusive now because they were based on the examination of tiny bits of tissue removed with a biopsy forceps from the summit of the adenoma (fractional biopsy), a procedure I now regard as totally unsatisfactory. It may profitably be stressed here that only by total removal in one or several large segments can the true pathologic nature of the adenoma be determined accurately. On the other hand, I have under observation over twenty patients with benign adenomas of from under three to over fifteen years' duration who have thus far declined treatment in whom there is still no clinical evidence of cancer [*51,52*]. Also, some sixteen years ago [*26*] I observed adenomatous tissue in infiltrating adenocarcinomas in sixteen of 150 consecutive colorectal specimens removed at operation, suggesting that cancer in these sixteen instances might have arisen in benign adenomas. Furthermore, thirty-seven of the 150 surgical specimens revealed one to five concomitant benign adenomas of less than 0.5 cm. in diameter. A more recent, as yet incomplete, study shows an appreciably higher incidence mainly because the surgical specimens removed consist of larger segments of adjacent colon than did those obtained sixteen years ago.

Interestingly, Rosenthal and Baronofsky [*53*] reported that they found that of sixty-one patients with metachronous cancer of the colon almost 50 per cent had adenomas within the original resected specimen in addition to the cancer; the great majority of these adenomas were located within 12 cm. of the cancer.

A study of the relationship of gastric adenomatous polyps to gastric cancer, based on microscopic observations in a series of 106 gastric adenomas found in forty-five patients, revealed an incidence of 13 per cent of transition to cancer [*54*]. The author believes gastric adenomas are reflections of generalized gastric neoplastic tendencies.

The theory that adenomas transform into invasive metastasizing cancer of the colon has been challenged by Spratt, Ackerman and Moyer [*55*]. These investigators presented evidence to show that the annual incidence of cancer of the colon (forty-five per 100,000) can be accounted for by the frequency with which adenocarcinoma arises in nonpolypoid colonic mucous membrane without involving the theory of the origin of adenocarcinomas of the colon minus adenomatous polyps. The frequency of distribution of adenomas and cancers of the colon is not the same. Adenomas are more evenly distributed throughout the colon than are adenocarcinomas, and the unit percentile frequencies of adenocarcinomas are higher than those of adenomas in the cecum, sigmoid colon and rectum, and lower than those of adenomatous polyps in the other parts of the colon. Of their 425 adenomas forty-three contained cells with the histologic appearance of cancer; only one of these forty-three had the abnormal cells questionably infiltrating the pedicle of the adenoma. Among 325 cancers of the colon, none had residuum of an adenoma.

Individual adenomas associated with cancer of the colon are not randomly distributed above and below the lesions, as should be the case if the cancers originated from the adenomas. In the right colon twenty of twenty-six adenomas were distal to the associated cancers while in the rectum and sigmoid colon sixty-eight of ninety-two polyps were proximal.

According to these authors [*55*] there appears to be little evidence for and much against the theory that adenomas degenerate into infiltrating, metastasizing cancers of the colon. These studies, of course, require confirmation.

Rider et al. [*56a*] believe that there is no direct evidence in their long term study that *all* adenomas are progressive lesions which eventually become cancer or that *all* cancers originate as a benign adenomatous polyp. However, in an earlier publication, the same authors had stated that cancer of the colon and rectum occurs "with five times greater frequency in polyp patients than in normal individuals (10.7 per cent versus 2.1 per cent)," and "that patients with multiple polyps are twice as likely to develop carcinomas as individuals with a single polyp" [*56b*].

This is perhaps an appropriate place to report

on Dunphy and his co-workers' [57] exploration of the question of spontaneous regression of colonic polyps and cancer. They cited cases which demonstrated that diversion of the fecal stream by colostomy is followed on occasion by reduction in the size of distally located carcinomas. Congenital polyps may regress in the rectum after subtotal colectomy and ileorectal anastomosis. Such regressions have been complete as far as gross identification of polyps is concerned. Microscopic study, however, may show islands of hyperplastic mucous membrane. Some of the questions that have been raised to which definite answers are not yet on hand are: (1) May there not be a factor leading to polyposis and carcinogenesis, which is produced or activated by the mucous membrane of the large intestine, and which is removed or deactivated by diversion of the fecal stream and partial or subtotal colectomy? (2) Does the colonic mucous membrane itself produce a factor which stimulates hyperplasia leading to polyposis or carcinogenesis? (3) Whatever the exact mechanism, does not the evidence suggest that diversion of the fecal stream may have a specific antitumor effect? (4) Should subtotal colectomy be more widely employed in the treatment of multiple polyps or cancer, on the ground that "it may eliminate a substance which stimulates the formation of polyps or cancer"?

Spontaneous postcolectomy regression of adenomas in the rectum was noted in two men with diffuse polyposis after colectomy and ileoproctostomy [58]. The adenomas closest to the anastomosis regressed first, while those nearest the anus regressed last. Cole and Holden also noted a diminution in the number of Feulgen-positive cytoplasmic inclusion bodies in the regressing adenomas and a suggestive decrease of desoxyribonucleic acid (DNA). In their opinion, inflammation and necrosis are not responsible for the regression of the adenomatous polyps.

The role of host resistance in the increased survival rate of patients with colonic cancer and associated adenomas is explained by Cole, O'Hara and Holden [59]. A group of fifty-nine patients with adenocarcinoma of the colon or rectum but without adenomas had a six year survival rate of 46 per cent; a group of twenty-eight with microscopically proved adenomas had a 75 per cent survival incidence. In patients with lymph metastases there was 50 per cent survival in the group with adenomatous polyps and 25 per cent in those without adenomas, suggesting greater resistance in the presence of adenomas. The longer duration of symptoms in the polyp group is similarly interpreted. When adenomatous polyps coexist with frank adenocarcinoma, there is a demonstrable and statistically significant increase in survival time.

The significance of intracytoplasmic inclusion bodies in adenomas and cancer of the colon and rectum has been discussed [60a]. Leuchtenberger has held that any rise in the DNA content of cells should evoke a suspicion of malignancy because cancers and precancerous cells show elevations, sometimes strikingly, of DNA. Basically it reflects growth and accelerated mitotic activity which is characteristic of all growing cells including those that proliferate normally.

Villous Adenomas. A special word about villous adenomas is perhaps in order. In the reviewer's experience [51] the benign villous adenomas are as unequivocally benign as their counterparts, the smooth adenomas. As in the smooth variety, malignancies in villous adenomas are differentiated unequivocally into noninvasive and invasive types (neither the presence of cell atypism [atypical changes] nor mitoses are considered indicative of clinical malignancy). Except for the greater incidence of unequivocal invasive cancer observed at the time of the initial examination in large or small villous adenomas, the reviewer has not seen any other features that would support the proposition that nonindurated or nonulcerating villous lesions are more apt to undergo malignant degeneration. This is in agreement with Dukes' experience [60b] but in conflict with the experience of other authors [61,62]. The finding of invasive cancer in small villous adenomas is not at all exceptional. Size of adenomas is no guarantee against cancer; however, it is believed by some authors that the incidence of noninvasive and invasive cancer in the large, villous or smooth adenomas is decidedly higher than in the smaller lesions. In one of my cases a large villous adenoma was observed for over fifteen years and was benign at necropsy after the death of the patient from totally unrelated causes. Large but totally benign villous adenomas (of more than 10 cm. in diameter) are encountered quite frequently. The rate of recurrence of smooth and villous adenomas is about the same.

Of interest is the oft unrecognized observation that villous adenomas may produce a loss of large amounts of fluid, sodium and chloride that leads to fatal electrolyte imbalance or depletion [63–67]. Studies of the serum, urine and, at times, the fecal concentrations of electrolytes are indicated in patients with villous adenomas of the colon and rectum.

Coloscopy: Shackelford and McGeehan [68] have developed an improved method of coloscopy at laparotomy by adding insufflation of a small quantity of air. Their technic balloons out the colon with air; flattens out any existing folds of mucosa and helps to detect small, otherwise hidden, new growths, ulcerations and so forth. Based on our study [69], coloscopy with air insufflation is superior to conventional coloscopy without air distention.

A still better case can be argued in favor of extended colotomy [51,69].

Marking of Site of Polypectomy: A technic for marking the mucous membrane of the bowel after polypectomy by means of a dye known as Lusane Brilliant Blue B was described [70]. The base of the polyp is injected with 0.2 cc. of the dye just prior to snaring of the lesion. This enables one to view the site of the lesion at subsequent follow-up observations. This concept is similar to that of Bush who used India ink for future identification of the previous site of a destroyed polyp. Complications may however follow such maneuvers. In one instance signs of peritoneal irritation occurred almost immediately after injection, "presumably because some of the ink went into the peritoneal cavity" and also conceivably as a direct result of perforation of the bowel wall [71].

Treatment: The precept of treatment of this lesion is bound directly and strongly to such forces as the malignant potential, the metamorphic forces or transition from adenoma to cancer. From the foregoing brief discussion of the cancer potential it is obvious that at the present time there is no direct evidence in any long term investigation that all adenomas are progressive lesions eventually becoming carcinoma or that all cancers originate as benign adenomas. The existing confusion about colorectal adenomas is largely the result of their variable biologic behavior pattern which is the crux of the situation. Because of ignorance or incomplete knowledge of these biologic forces at the present time, and since it is still premature to treat adenomas as though they were completely benign, a middle-of-the-road therapeutic position is presently justified. Stated in another way, since there are no gross or histologic criteria that will enable the intestinal surgeon or the pathologist to predict a benign course for a given adenoma, each patient with an asymptomatic colonic polyp which requires transabdominal removal is judged on its special individual merits but the rectal or rectosigmiodal adenomas which can usually be removed via the endoscope are preferably extirpated on recognition even if only a minority of such adenomatous polyps become cancerous. The only exceptions to this policy are systemic contraindications and patients whose longevity is not expected to exceed six to twelve months [51].

While most therapists properly dispose of pedunculate adenomas that are within the reach of the sigmoidoscope by means of the electrothermic snare and thus obtain the entire lesion for histologic examination, many proctologists still destroy sessile adenomas *in situ* by means of fractional electrocoagulation without the removal of the lesion for microscopic examination.

In the reviewer's practice [51] whenever the stalk or point of origin from the mucosa is visualized, an attempt is made to remove the lesion at or near the base by means of a high frequency snare. The existence of the so-called "phantom" adenoma must be recognized because it frequently vanishes from sight. This is a polyp whose head is visualized sigmoidoscopically but the point of origin or attachment in the mucosa cannot be determined. The point of origin may be quite a distance away depending on the length of the pedicle. With increasing experience, more and more small or medium-sized sessile (smooth or villous) adenomas are also extirpated successfully by means of the electric snare. Whenever technically feasible, the large, smooth and villous, sessile adenomas, particularly those that are situated on the posterior or lateral wall of the rectum, are removed by means of the double-loop resector. Most of the tissue thus resected retains sufficient of the original architecture for adequate histopathologic examination. The use of fractional or serial coagulation for the destruction of any adenomas that rise to an appreciable extent above the surrounding mucosa is avoided because malignancy, especially in the depth of the polyp, may thereby be overlooked for some time. The few exceptions to this policy

have been described [*51,71*]. In short, whenever technically possible, smooth or villous, sessile adenomas are removed by means of the electric snare or the double-loop resector and, occasionally, by a combination of both instruments. Fractional coagulation, like fractional biopsy, of adenomatous polyps is therapeutically unwise especially when the lesion can be removed *in toto* by other means, lest invasive malignancy be overlooked for some time. Sixteen such instances have come to my attention during four and one-half years.

The use of electrocoagulation requires practice, experience and dexterity; it is not without risk, but the remote risk should not bar the proper use of this excellent therapeutic modality.

Noninvasive malignant adenomas (containing foci of noninvasive cancer or atypical cytologic changes in the head of the polyp) with either long or short stalks are extirpated at the base by means of the electric snare. No recurrence for one to five years has been observed in over sixty cases thus treated. This form of treatment has also been successfully employed in five cases of malignancy involving the pedicle near the head but in which the remaining long pedicle was free of cancer upon serial section; there was no evidence of recurrence in a period of observation of over five years.

Lochridge and Jackman [*72*] have evaluated the merits of conservative treatment in 244 patients who had polypoid lesions in which histologically proved, early adenocarcinomatous changes where diagnosed in the years 1945 through 1949. Their results show that this form of treatment is effective when there is (1) no fixation to the surrounding structures and the lesion is freely movable over the underlying muscularis of the bowel wall; (2) no nodularity within the lesion; (3) no gross evidence of linear or serpiginous infiltration of adjacent mucosa or submucosa; (4) no evidence of obstruction and (5) no evidence of necrosis or of ulceration of the lesion whether sessile or pedunculate. Adenomas that are less than 5 cm. in diameter are more suitable for conservative management than are the large growths.

Patients who refused or who were regarded as poor risks for extensive operations because of systemic disease have been treated conservatively with success even if they did not satisfy the foregoing criteria of conservative therapy. (See Section on Cancer.)

When invasive malignancy is encountered in an adenomatous polyp, the lesions should be treated promptly by adequate surgical means. Deliverable benign rectal adenomas should be excised via the anal canal [*71*] or through a posterior proctotomy [*71,73*]. Posterior proctotomy without division of the sphincters affords excellent exposure of even large tumors. This operation is extremely useful in special situations [*71*].

Pedunculate adenomas situated above the reach of the sigmoidoscope, if firm, impressionable and freely movable at the mucosal base, are still treated by transabdominal polypectomy through a colotomy incision. Ulceration or induration of any part of the polyp or fixation at the base calls for colonic resection of the scope utilized for frank cancer. The controversy pertaining to the routine resection of the adenoma-bearing segment of the colon for the extirpation of all pedunculate adenomas situated above the reach of the conventional sigmoidoscope has not yet been resolved.

Sessile adenomas in this anatomic area are best treated by segmental resections. There are exceptions to this policy, particularly when the adenoma is "liftable" or freely movable with the adjacent mucosa, in other words, when there appears to be no signs of fixation whatsoever. This applies particularly to the older age group of patients [*69*].

Follow-up: Patients with adenomas should be examined at intervals of one, three, six and twelve months after conclusion of treatment, and then semiannually or yearly for at least five (indefinitely in some cases) consecutive annual examinations of the colon (radiography) and rectum (endoscopy).

In one study [*56*] the rate of formation of new adenomas was over 41 per cent; in multiple adenomas the rate was 55.7 per cent. The yearly rate of recurrence approximated 10 per cent. By diligent effort, 92 per cent of their 537 patients had at least one follow-up examination and 149 patients had at least four consecutive years of follow-up investigation.

A recurrence rate of about 10 per cent was also observed by the reviewer in a study of villous adenomas. Of forty-one patients who were observed for five years or longer, four had recurrences. All of these were as benign as the original adenomas and were successfully retreated electrothermically. In one of these patients the lesion recurred three times

during an observation period of twenty-seven months.

Polyps in Juveniles. Polyps are the most common tumors in children [*74*]. Bleeding via the anus is one of the common symptoms [*75*]. Nearly one-fifth of all cases of bleeding from the rectum in children are due to polyps. Neither malignant changes in a juvenile polyp nor villous adenomas have been observed with certainty before puberty [*71,76,77*]. Students of this subject agree that "the potential of malignant degeneration in polyps of the rectum and colon in children is probably no greater than that of normal rectal or colonic mucosa" [*78*]. As in adults, the term adenocarcinoma, grade 1, is misleading and should be dropped from any discussion of adenomas.* As in adults, it appears that not all pathologists agree as to the precise diagnostic microscopic criteria of malignancy; in some doubtful cases some pathologists render a diagnosis of malignancy largely for fear of missing one. The treatment is essentially the same as for adults. Treatment should best be completed before the child reaches the age of fifteen years [*75*]. But intestinal resection is unnecessary as juvenile polyps very rarely, if ever, are the seat of malignancy [*51*]. The prognosis is usually good.

Familial Polyposis. This lesion was first reported by Menzel in 1721 and was described by Virchow in 1863. Its hereditary aspects were noted by Cripps in 1882 and its precancerous tendency by Lockhart-Mummery in 1925. In our times, Dukes and Lockhart-Mummery have studied this problem most comprehensively. They have reported families with either one or more members who presented this lesion. Studies to date have revealed that the familial and solitary cases are one and the same disease. Predisposition to polyposis is transmitted by mendelian laws in the dominant pattern. Half of the children of a person inheriting this speciality are prone to have polyposis. They may appear normal at birth and frequently during childhood as symptoms are rarely present before the second decade of life and usually not until about the age of twenty-one years. Dukes [*79a*], however, has pointed out that in the absence of symptoms, polyps can be found on endoscopy during the preclinical or occult phase. He described three phases in the development of this disease: stage 1 characterized by an absence of symptoms, signs and lesions; stage 2 in which polyps develop silently or asymptomatically and stage 3 in which the polyps, by producing symptoms and signs, demand close supervision and surgical treatment. The reviewer [*51*] has observed two patients in whom adenomas were absent as far as the conventional 25 cm. sigmoidoscope could visualize. The presence of adenomas was established on radiography in one case and at necropsy in the other patient.

It is now well recognized that congenital polyposis may be detected when certain abnormal growths are found elsewhere in the body such as fibromas, lipomas, fibrolipomas, epidermoid cysts, leiomyomas, dermoids, desmoids, osteomas, bony exostoses or fibrosarcomas. In 1951 Gardner [*79b*] first described the familial syndrome or triad of congenital colonic polyposis, multiple osteomatosis and multiple soft tissue tumors of the body surface. The finding of multiple hard and soft tissue tumors should alert the clinician to the possible association with familial polyposis and should lead to endoscopy and roentgenography of the colon.

Smith [*80*] believes that desmoid tumors occur most frequently and, among other factors, may also be the result of a tendency in these individuals to proliferate cells of mesenchymal origin. Desmoid tumors apparently develop most commonly in abdominal incisional scars, hence not all nodules in colectomized patients should be regarded as cancer implants.

The occurrence of osteomas and/or skin tumors has been reported by Lazar and Bendix [*81*].

The occurrence of malignant tumors of the central nervous system in two teenagers with congenital polyposis has also been reported [*82*]. These are believed to be examples which support the theory that hereditary transmission of this disease as a dominant characteristic can be associated with other potentialities residing in the same gene.

The risk of cancer in this disease is great indeed. Although the age at which cancer first occurs varies enormously, anyone with congenital polyposis who is more than twenty-five years old is decidedly within the danger zone. By the age of thirty invasive cancer of the colon occurs in 50 per cent of patients who have symptoms. More than one cancer may be present.

Surgical treatment offers two major operations: (1) colectomy and permanent ileostomy,

* *Cancer*, 10: 131, 1957.

or (2) subtotal colectomy [83a] and very low ileorectal anastomosis [51]. An end to end anastomosis is best performed to avoid the formation of a blind pouch. The performance of ileoproctostomy does not require the mobilization of the rectum thus avoiding interference with sexual function. Colectomy is indicated in the presence of rectal cancer or in the presence of numerous rectal adenomas that cannot be effectively destroyed by electrocoagulation. However, in view of the recent observations that following ileoproctostomy the remaining polyps in the rectal stump regress or disappear spontaneously [57,58], every effort should be made to preserve a part of the rectum. Historically, anastomosis of the ileum to the terminal colon as a primary operation had been performed by Lilienthal [83b] as far back as March 6, 1900 and was followed by subtotal colectomy on June 15, 1900 (*Am. Med.*, 1: 164, 1901). Postoperatively, it is essential to maintain frequent follow-up of the rectal stump for the rest of the patient's life lest cancer develops. It is also imperative to examine the available relatives of these patients [74].

Anal versus abdominal ileostomy is another procedure worth considering.

Gas cysts of the colon may simulate multiple polyposis [84].

Peutz-Jegbers Syndrome. Since its latest rediscovery, this syndrome has become a definite clinical entity but one with many unsolved aspects [85]. It is familial and hereditary. The genetic factor is mendelian dominant (gene) with incomplete penetrance but sporadic cases occur. The hereditary nature of this syndrome was observed in ten members belonging to three generations of a family [86].

The polyps may occur anywhere in the alimentary tract but are predominantly found in the small bowel. Intestinal obstruction (intussusception) and blood loss are prominent features [87] in addition to the melanin deposits on the lips, face, hands and feet, the most characteristic of which are the pigment spots on the buccal surface, especially on the deep inner surface of the lips and occasionally elsewhere in the mouth. The fingers and toes are also common sites of pigmentation. The potential malignant nature of the polyps is still debatable. The bulk of evidence is against the chance of malignant transformation. The latest studies [88] assume that these polyps are truly a developmental anomaly rather than "premalignant" adenomas. Bartholomew and Dahlin [89] believe these lesions to be hamartomas; none of their polyps appeared malignant or premalignant. As far as ascertained, no one with the Peutz-Jeghers syndrome has ever died of cancer that arose in a polyp of the small bowel, nor have any metastatic lesions been reported in this syndrome [90]. A notable exception is Beinfield's case [91].

We [85] have reported the occurrence of benign colonic adenomas in patients with typical circumoral melanin pigmentation without clinical, endoscopic or roentgen ray evidence of such polyps elsewhere in the gastrointestinal tract.

The accepted treatment is the conservative local excision of the polyps through enterotomy incisions inasmuch as the area of polyp formation is seldom, if ever, localized. Removal of polyps through enterotomies, with or without the aid of electrocoagulation, is the usual and accepted procedure. Intestinal resection of the polyp-bearing areas is unnecessary or practically impossible [92]. As in colotomies, an endoscope may be inserted into both limbs of the intestine thus observing the lumen of the intestine proximally and distally for some 25 cm. from the site of enterotomy incisions. Vary utilizes an extended enterotomy through which he evaginates (or prolapses) a considerable distance of the mucosa for direct visualization and easy removal of polyps, a procedure we advocate for the detection of colonic adenomas at laparotomy [85].

An interesting instance of circumoral and buccal mucocutaneous pigmentation associated with cavernous hemangiomas involving almost the entire small bowel but without evidence of polyps in the alimentary tract has been described [93]. The possible relationship of this unusual clinical syndrome to Peutz-Jegher's has been speculatively described.

Lymphomas. The reviewer agrees with Scott [94] that confusion of terminology has further confounded this subject which is already intrinsically obscure. Lymphomas arise from lymphoid tissue of the intestinal submucosa.

Benign: Holtz and Schmidt [95] prefer the term "lymphoid polyp" to the term "benign lymphoma." The rectal lesions are usually solitary, polypoid and composed of lymphoid follicles which are limited to the submucosa and mucosa. The synonyms are lymphoid polyp, polyp of lymphatic tissue, lymphoma,

simple lymphoma, abnormal accumulation of lymphoid follicles, primary rectal lymphoid tumors resembling internal piles and benign lymphoid hyperplasia of the rectum. The chief or major aspect of this lesion pertains to the fact that it may be (and frequently is) diagnosed erroneously as malignant lymphoma.

The polyps may vary in size from 5 mm. to over 3 cm. in diameter. Microscopic studies led to the conclusion that lymphoid polyps are the result of chronic inflammation, possibly at the site of minor anatomic abnormalities [*95*].

Malignant: These tumors tend to remain localized for a long time. At its inception the lymphoma is located submucosally and may grow either as a polypoid mass or as a diffuse infiltrating lesion under the mucosa. The submucosal extension makes it extremely difficult for the surgeon to define the limits of the neoplasm. Spread occurs primarily by direct extension or along the lymph channels; distant metastasis, however, occurs late. Lymphomas of the colon produce a palpable mass with signs and symptoms of intestinal obstruction [*96*]. Lymphosarcoma of the rectum occurs quite frequently. Chemotherapy in the form of nitrogen mustard and TEM has not produced satisfactory results: wide surgical resection of the lesion followed by irradiation produces the best results. Awareness of this lesion could lead to earlier diagnoses and earlier resection with more possible cures [*97*]. Inoperable tumors should be treated by radiotherapy [*98*]. Sporadic cases of Hodgkin's disease of the colon are reported [*99*].

Lipoma. Submucous lipomas arise from the adipose tissue of the bowel wall. They may project into the lumen, having a long pedicle in some instances, and are covered by a thin mucous membrane imparting a pinkish yellow color. They are usually soft and smooth in consistency. They may appear in any segment of the colon, although they are said to occur most often in the cecum and ascending colon. At times lipomas prolapse through the anal orifice; this is also sometimes true of those that originate high in the colon. This comes about by virtue of either a long stalk or colorectal intussusception. Significant rectal bleeding may occur even in the absence of ulceration [*100*]. Intussusception by colonic lipomas is not at all rare [*100,101*]. In fact, the presence of intussusception in adults should arouse the suspicion of a colonic lipoma. Curiously, at times a lipoma may be confused with a prolapsing internal pile. Roentgenologically, lipomas sometimes appear somewhat compressible on multiple spot roentgenograms [*101*]. X-ray films are often distinctive enough to suggest the correct diagnosis [*102*].

Surgical treatment is indicated regardless of whether the lesion causes acute or chronic symptoms; lipomas are usually inconspicuous until the onset of complications such as ulceration, bleeding, intussusception or obstruction [*102*]. Lipomas are sometimes expelled spontaneously. Over 80 per cent of lipomas produce symptoms. Malignancy in lipomas has, as far as I can determine, never been reported.

A case of diffuse symptomatic submucous lipomas of the intestine has been reported [*103*]. A familial incidence has not been established.

Carcinoid (*Argentaffinoma*). Of twenty-five patients with carcinoids of the rectum (*104*) ten were malignant, a greater incidence than hitherto reported, and six were incurable because of distant metastases. Carcinoids 2 cm. or larger in diameter were malignant in nine of ten patients, whereas only one of fifteen carcinoids less than 2 cm. in diameter was malignant.

In general, carcinoids occur in the entire alimentary tract from the cardia to the rectum. They are most often found in the appendix (70 per cent), the rectum (10 per cent) and in the terminal ileum. The incidence of malignancy of the small bowel carcinoid ranges between 25 to 50 per cent. The exact incidence of colorectal carcinoids is not known at this time. As already indicated [*104*], the tendency of malignancy of carcinoids is higher than reported. Although this does not tally with the reviewer's experience, the malignant potential should not be underestimated. It might perhaps be safer to consider it as having low grade malignancy [*74*].

Carcinoids appear to arise from the chromaffin, Kulchitsky cells in the crypts of Lieberkühn; no carcinoids are found in areas devoid of Kulchitsky cells. Carcinoid tumors occur as either solitary or multiple submucosal, firm nodules. At times they are polypoid, annular, constricting and ulcerating. Usually, however, the overlying mucous membrane is smooth and intact, and movable or liftable with the surrounding mucosa to a varying degree.

The treatment of carcinoids sometimes poses problems largely because of our limited knowl-

edge of their biologic behavior and the definite cancer potential. Local excision of benign lesions is sufficient therapy. There are those who prefer destruction of the carcinoid by electrothermia. The reviewer favors operative excision. Fifteen patients so treated are well, eight having survived longer than five years [*104*]. When apparent or real local invasion (with or without regional lymph node metastasis) is suspected, an adequate cancer operation is indicated. In the presence of distant metastasis (liver, lungs, bones and so forth) operation is useless as these patients die relatively early of widespread carcinoid disease.

In recent years there has been an outpouring of papers dealing with the clinical and metabolic (endocrine) manifestations of the malignant carcinoid syndrome [*105–110*]. The carcinoid, usually of the small bowel, not only metastasizes to the liver but a nonmetastatic injury also occurs to the valves of the right heart and to the skin blood vessels. Failure to produce similar injury (sclerosis of the valves) on the left side of the heart is probably due to the destruction of the serotonin by monoamine oxidase present in the lungs during the pulmonary phase of blood circulation [*111*]. The symptoms include, in addition to diarrhea, episodes of flushing, mottled cyanosis and signs of right heart failure and asthma. Presumably the malignant carcinoid produces high blood levels of serotonin or 5-hydroxytryptamine by enzymatic hydroxylation and decarboxylation of the amino acid tryptophan. Pharmacologically it is a very potent agent which is converted by an enzyme, monoamineoxydase, into a pharmacologically inactive compound called 5-hydroxy 3-indolacetic acid [*105*]. The latter is excreted in increased amount in the urine (quantities range from 2 to 7 mg. per twenty-four hours). Serotonin, after reaching the right heart from a liver filled with metastatic deposits, directly injures the endocardium (a normal liver destroys serotonin that reaches it). The other pharmacologic consequences of serotonin are: (1) nonbloody diarrhea which is probably due to its stimulation of the intestinal smooth muscle and an increase of peristalsis; (2) skin flushing with blotchy cyanosis (this can be observed following the rapid intravenous administration of serotonin, especially, to hypertensive patients); (3) biphasic blood pressure response; (4) increased pulmonary artery pressure and histologically demonstrable thickening of the pulmonary artery walls; (5) bronchoconstriction (observed in animals receiving serotonin); (6) pellagra-like skin lesions; (7) pulmonic stenosis and tricuspid insufficiency and (8) arthropathy [*105*].

To date, the known serotonin antagonists have been therapeutically useless [*109*]. A note of warning should however be added: Ingestion of bananas produces an increased urinary excretion of the serotonin metabolite [*106*]. Bananas also contain large amounts of norepinephrine. Of clinical significance is the fact that ingestion of bananas may lead to erroneous diagnoses of carcinoids and pheochromocytoma by producing an increased urinary excretion of serotonin and norepinephrine and their metabolites. It remains to be determined whether other edible plants contain these compounds. In this connection it should be pointed out that the oral administration of 20 mg. of serotonin to patients fails to produce any apparent physiologic effect, whereas as little as 1 mg. of serotonin administered intravenously produces marked effects [*106*].

Interestingly, metastatic carcinoid bronchial adenomas may cause the functioning carcinoid syndrome identical to that occurring with malignant intestinal carcinoids [*112*]. The functioning carcinoid syndrome has also been associated with scleroderma [*111*].

Experimentally, the serosal application of serotonin increases motility in human and canine intestines *in vivo*. However, peristalsis is said to be neither augmented nor inhibited by serotonin in humans. Is the increase in motility due to serotonin's known ability to stimulate smooth muscle in the intestine?

None of the six patients with primary rectal carcinoids associated with extensive metastases to the liver already alluded to [*104*] has exhibited the clinical phenomena of the functioning malignant carcinoid syndrome. The malignant intestinal carcinoids that are known to have evoked this syndrome have apparently originated either in the small bowel or colon. It is, however, difficult to understand why rectal carcinoids do not produce this functioning syndrome since the rectum is the second most frequent site for the occurrence of extra-appendicial carcinoids.

Endometriosis. The incidence of endometriosis of the colon is probably around 1 to 2 per cent (113). The majority of endometriosis is asymptomatic; usually it is an incidental find-

ing. Direct transperitoneal implantation and cellular metaplasia are probably the most important and common etiologic factors. The lesion is usually located in the subserous or muscular coat of the bowel. The main bulk of the lesion is composed of fibrous tissue, contraction of which may produce obstruction. When it penetrates to the submucous or mucosal layer, the lesion may mimic cancer. Endometriosis is hormone dependent. The lesion may vary from a pinhead-sized nodule to over 5 cm. in diameter.

The symptomatology presents either obstructive or irritative (colic and diarrhea) features, or both. In some women the symptoms are aggravated during the premenstrual phase. The exact diagnosis can be made only histologically and, most of the time, only if the pathologist is experienced and alert to this possible diagnosis; biopsy specimens may resemble those of cancer. On endoscopy and palpation alone, many lesions cannot be distinguished grossly from cancer. Radiography should always be resorted to; roentgen changes of the rectosigmoid and above are diagnostically helpful [*114*]. Of great diagnostic help is a pelvic examination that elicits evidence of pelvic endometriosis. Obscure gastrointestinal symptoms occurring in association with menstrual disturbances should suggest extragenital endometriosis and a pelvic examination [*115*]. But it should not be forgotten that endometriosis and cancer may coexist. Because of this possibility these lesions should be excised whenever intestinal continuity can be restored. Opinions differ, but bilateral oophorectomy should be performed in conjunction with other procedures. The reviewer has never seen a need for permanent colostomy because of the presence of extensive pelvic fibrosis [*113*].

Since this lesion is hormone dependent it is quite logical to try a course of male hormone therapy. Methyltestosterone administered sublingually relieved the symptoms with resolution of a partially obstructed lesion of the sigmoid colon [*116*]. Subsequently, operation for an unrelated condition confirmed the disappearance of the original sigmoidal lesion. The reviewer has successfully treated two patients with similar conditions.

Smooth Muscle Tumors. Smooth muscle tumors of the alimentary tract have been very lucidly discussed [*117*]. Six of these tumors occurred in the rectum, five of which were sarcomatous and one was a benign myoma. Surgical removal is the treatment of choice but radical excision is preferred.

Inflammatory Polyps. Nonspecific (produced by irritation or trauma) or specific inflammatory polyps, e.g., Schistosoma, occur often enough to warrant mention.

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Proctologic Notes

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PART I

THESE PROCTOLOGIC notes were obtained during the 1958 Quadrangular Proctologic Convention. They include the more useful technics of surgical treatment and methods of postoperative care. They are grouped under separate categories with an occasional introductory note or comment. They express the divergent views of leading proctologists on proctologic subjects.

NEWER CONCEPTS OF ANORECTAL ANATOMY

These [*1*] pertain to the anatomic and functional interrelationship of the internal and the external sphincter muscles to each other and to the conjoint longitudinal muscle. (Fig. 1A.) Also discussed was the newly described anal submucosal space and the intermuscular space. With the patient under anesthesia and in position for anorectal surgery, the subcutaneous external sphincter muscle retracts cephalad and laterally. The distal outer margin of the internal sphincter muscle now comprises the muscle at the anal verge. (Fig. 1B.) Therefore in sphincterotomy for whatever reason it is the internal sphincter that is severed and not the subcutaneous external sphincter muscle as was taught previously. The mode of termination of the conjoint longitudinal muscle is redescribed. Its several septa spread out fanwise and pass through and around the lower border of the internal sphincter to join the musculus submucosae ani; other fibers pass between the lower border of the superficialis and the subcutaneous external sphincter into the ischiorectal fossa. The main insertion is into the skin overlying the subcutaneous external sphincter. These various fascial planes determine the spread of infection.

Morgan and Thompson [*1*] go into great detail to show that the internal sphincter and Miles pecten band are one and the same structure.

SURGICAL TECHNIC

The basic concepts of proctologic surgery are to handle tissues gently, avoid trauma to normal tissue and to remove only diseased tissue. Since, in most instances, infection is an etiologic factor in anorectal disease, surgical wounds originating in the anorectum should extend through the anal canal and onto the skin for

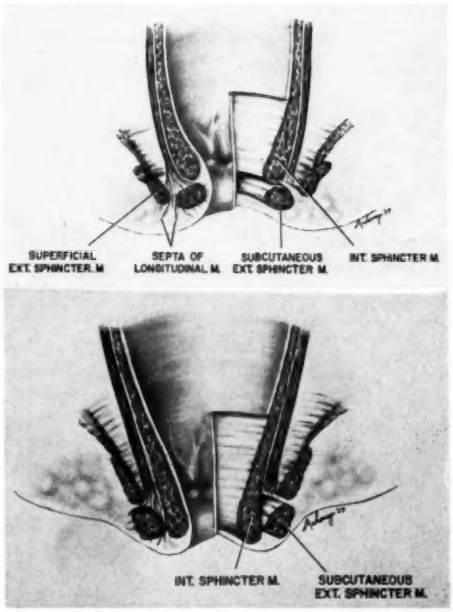

FIG. 1. Showing the effect of anesthesia on the relationship of the subcutaneous external and internal sphincter muscles. A, normal relationship of the internal and subcutaneous external sphincter muscles. B, prolapse of the internal sphincter muscle with anus relaxed under anesthesia.

drainage. This will result in less pain, fewer complications and early healing. Excessive pain is often the result of trauma to tissues with subsequent lymphatic stasis and edema. It also follows inclusion of functioning muscle tissue or sensitive anal epithelium in the strangulating ligature. In a properly performed hemorrhoidectomy, minimal postoperative discomfort is attained if ligatures are placed only around the insensitive rectal mucosa and the contained hemorrhoidal vessels.

SUTURES

There is general acceptance among proctologists of the use of finer rather than the heavier sutures. Number 0 or No. 00 transfixion chromic suture ligatures are used above the dentate line (as in hemorrhoidectomy) and No. 000 chromic sutures at the dentate line. A few use No. 1 chromic and a lesser number plain No. 1 catgut. Silk or linen suture ligatures, popular a number of years ago are rarely used today. Bleeding vessels are controlled with No. 00 plain catgut ties.

DRAINAGE IN ANORECTAL OPERATIONS

The preparation of the drainage wound also was discussed as well as the method of keeping it open. The wounds may be large or small and of a variety of shapes and forms such as circular, pear or spindle-shaped (as in hemorrhoidectomy), racquet-shaped or angulated away from the midline if situated posteriorly or butterfly-shaped anteriorly (as in fissurectomy). It was emphasized that a smooth flat open wound without overhanging edges is essential.

There appears to be a difference of opinion among proctologists as to the necessity of extending the anorectal operative wound externally for purposes of drainage. A few omit this important operative step entirely, others obliterate the wound with transfixion sutures partially or wholly in order to hasten the healing time. The majority of proctologists interviewed, however, were of the opinion that operative wounds which originate in the rectum should extend through the anal canal and out onto the anal skin for purpose of drainage. This was based on the principle that healing of surgical wounds is closely related to the efficacy with which the lymphatics and deeper tissues are drained of infected material. Adequate drainage will prevent local vascular and lymph stasis and edema. Edema of the anal skin blocking drainage increases the susceptibility to local infection and deposition of fibrous (scar) tissue. It was emphasized that a smooth flat open wound of proper shape or size without overhanging edges is the factor essential to the promotion of free drainage.

Methods employed to maintain an open wound were also discussed. These included the use of rubber dam tissue or a soft rubber tube surrounded by vaseline gauze, Oxycel® or Gelfoam.® These are inserted into the anal canal or into the wound proper. It was stated that a nonreacting fiber was the best postoperative dressing. Gelfoam was recommended since it stimulated healthy granulation tissue which did not become easily infected. Other methods recommended for maintaining an open drainage wound were the application of nitric acid (immediately neutralized with alcohol) or electrocoagulating the margin of the wound.

IMPORTANT DETAILS OF POSTOPERATIVE CARE

Good surgical technic employed in anorectal operations is important, but proper postoperative care adds to the patient's comfort and insures good functional results.

The various methods of postoperative care may be divided into the following categories: (1) postoperative pain relief; (2) local care of postoperative wounds; and (3) convalescent care.

1. Postoperative Pain Relief. A. Immediate: For the immediate relief of postoperative pain, a variety of medications were prescribed by the proctologists who were interviewed; namely, meperidine, 50 to 100 mg. every two or three hours; morphine sulfate, 1/6 to 1/4 gr. every three or four hours; Pantopon,® 1/3 gr. every three or four hours; and meperidine, 50 mg. combined with 50 mg. Phenergan,® every four hours. Most proctologists prescribe these medications only for a period of twenty-four hours. It was remarked that some patients require no narcotics, while others require comparatively large doses frequently, depending on their tolerance to pain. A number of proctologists stated that with careful technic many patients have minimal or no postoperative pain and only occasionally require an oral analgesic.

B. Prolonged postoperative analgesia: (1) Preoperative injection. The injection of an oil soluble anesthetic preoperatively around the operative field was disapproved of by a number of proctologists. Several stated that it was not

necessary for the relief of postoperative pain if the operation was properly performed. Some feared complications such as abscess or postoperative hemorrhage. Others were of the opinion that sphincter contraction aided hemostasis postoperatively while the contrary occurred with a relaxed sphincter ani.

Comment: Properly injected in sufficient amount (10 to 20 cc.), preoperatively, while the field is sterile and with the index finger in the rectum to avoid mucosal penetration, the analgesia which results from an oil soluble anesthetic overcomes sphincter spasm, anesthetizes raw wounds and gives welcome relief from postoperative pain especially in the hypersensitive individual.

(2) Oral analgesia. After twenty-four hours most proctologists control postoperative pain with various combinations of aspirin alone (APC., Bufferin® or Empirin®) or with added phenobarbital, Darvon,® codeine or Tuinal.®

Comment: The addition of a tranquilizer such as Compazine,® Miltown® or Equanil® to these oral analgesics will markedly enhance the relief of postoperative pain.

(3) Hydrotherapy for pain relief. It appears to be routine with most proctologists to prescribe hydrotherapy for the relief of postoperative discomfort. A few disagree as to the virtue of such a treatment. They claim that the wounds become moist and soggy ("waterlogged") and thereby become a fertile field for infection. The following is a brief outline of the more common hydrotherapeutic modalities: (a) Sitz bath which may be taken several times daily in a bath tub or in an enameled or plastic baby bath; (b) perianal douche administered by the patient who sits over the edge of a tub and irrigates the wound with an ordinary rubber hose bath spray (the spray tip is removed), with one hand retracting the buttock while warm tap water irrigates the wound; (c) hot moist compresses with normal saline which are effective and do not burn; (d) warm half strength witch hazel compresses; and (e) hot water bag to the perineum which will keep the moist dressing warm.

The application of hot moist compresses by the patient are favored by some proctologists because it relieves nursing care and keeps the patient constantly occupied.

Postoperative Bowel Management. There is a wide variety of methods employed to initiate the first postoperative bowel movement which usually is expected on the third postoperative day. Medications prescribed preoperatively include Sulfathalidine® or Sulfasuxidine® for their potential laxative effect. Postoperative medications include mineral oil, 1 oz., or milk of magnesia, 1 oz., separately or combined; a dram of fluid extract cascara sagrada may be added to each or both for added effectiveness. Some prescribe a saline laxative such as sodium sulfate, a dram in a glass of cold water before breakfast. The following retention enemas were recommended: normal saline, Sigmol® enema or Fleet® enema. It was stated that the best tolerated and least uncomfortable enema results from the instillation of 4 to 6 oz. of warm Mazola or mineral oil at bedtime through a catheter and bulb syringe which are to be retained overnight.

Comment: A well formed stool causes less discomfort to the patient than an irritating, watery bowel movement such as is caused by cathartics and saline laxatives. This may be achieved by prescribing one of the newer synthetic wetting agents such as Peri-Colace® and its various combinations, Dialose Plus® or Dorbane.® Their composition usually consists of calcium and sodium alginate (for bulk), dioctyl sodium sulfosuccinate (stool softener) and anthroquinone, a derivative of cascara (peristaltic stimulant). These drugs usually produce a formed stool and since the normal direction of dilatation of the sphincter ani is outward, such a stool should be encouraged. The various hydrogels, konsyl, hydrocil, Metamucil® and Siblin,® were also prescribed by several proctologists to secure a soft formed stool.

2. Local Care of Postoperative Wounds. A variety of comments and suggestions were obtained in the treatment of anorectal surgical wounds. A number of proctologists were opposed to the application of any medication to the wound either for the relief of pain or to promote healing. They stated that the healing of a wound may be retarded by chemical agents; for example, ointments to which the patient may be allergic. They expressed the opinion that most wounds are overtreated, for agents which are strong enough to kill bacteria are strong enough to injure tissue cells. To promote healing of a wound, surgical excision of the diseased tissue is all that is necessary. An open flat drainage wound will then heal by granulation. Healing by granulation and epi-

thelization, provided the surgery is correct, maintains its own course in time with nature's rate and method of healing in spite of the application of lotions, ointments, soothing stimulants or antiseptic or caustic medications. It was generally agreed that the principle local treatment entails spreading the wounds apart digitally and preventing bridging, either by the passage of a bent probe over the surface of the wound or by the application of a cotton swab or glass rod lubricated with K-Y® jelly. It was their opinion that application of a mild solution of 5 per cent silver nitrate to control exuberant granulation tissue is sufficient local treatment. In order to improve wound healing, they recommended therapeutic doses of vitamin B complex with vitamin C and a high protein diet.

In the presence of a slow healing wound, some recommended eliminating the anal dressing entirely, allowing the wound to be freely exposed. Ultraviolet light and infrared heat were also recommended. It was clained that a wound free of moisture and dry is less likely to be infected and heals more rapidly.

However, a number of proctologists stated they routinely prescribe local medications for postoperative wounds. For the relief of pain, anesthetic ointments such as Pontocaine,® Americaine® aerosol and Tronothane are used. For local infection, the various antibiotic or steroid ointments are used; such as 3 per cent penicillin, 3 per cent Aureomycin,® 3 per cent Achromycin,® Neosporin,® or hydrocortisone in the form of Neo-Magnacort® topical, Neo-Cortef® and Furacin® soluble dressing. Drugs used for stimulating growth of granulation tissue include White's vitamin A and D ointment, Tashan® cream and Furacin soluble dressing; and for epithelization, 5 per cent scarlet red. The preparation tucks was recommended as a generally satisfactory, soothing, astringent dressing for local postoperative use. The dried blood concentrate, Lyocyte® powder, was highly recommended as a topical stimulating application for the healing of intractable or infected postoperative wounds that are resistant to other forms of therapy. The powder may be dusted on the lesion once or twice daily. It acts as an absorbent of profuse purulent or serous exudate. Panafil® and Varidase® topical were also recommended, as each provides nonsurgical debridement of blood and pus and therefore accelerates healing.

Prophylactic treatment: A number of proctologists prescribe sulfonamides and antibiotics, administered orally pre- and postoperatively, in order to hasten the healing of wounds. They stated that if prescribed preoperatively, there is a smaller incidence of infection and inflammation of tissues and less tendency to fibrosis; also, there is less abdominal pain and distention. When these medications are given postoperatively, especially if the wound is infected, they eliminate infection and thereby hasten healing.

Comment: There are several factors in connection with these pre- and postoperative medications which deserve discussion. The sparsely soluble sulfonamides when used alone are bacteriostatic in contradistinction to the antibiotics which are bactericidal. Therefore, in modern therapy antibiotics when indicated should always supercede sulfonamides which are prescribed only when the patient is allergic to the antibiotic. Prescribing these drugs is not a substitute for sound surgical principles, refinement of technic or good postoperative care.

Postoperative Digital Dilatation. The problem of dilating the anal canal postoperatively appears to be a matter of personal choice among proctologists. Some omit it entirely; others introduce the index or fifth finger five to ten days postoperatively and repeat it once or twice weekly for three to six weeks. Most proctologists, however, give close attention to the surgical wounds and institute some form of digital dilatation (gentle massage). A few employ a metal or plastic St. Mark's dilator. The patient may be provided with one of these dilators and taught to insert it with a rotary motion. It may be lubricated with a stimulating or antiseptic ointment such as White's vitamin A and D ointment, neomycin and Furacin. Many believe that despite good surgery, stenosis or stricture may occur if regular dilatation is omitted.

Ambulation: It was the general opinion that early ambulation assists wound drainage, improves circulation and promotes healing of wounds. Some advise ambulation on the evening of the day of operation, but the majority advise it on the first postoperative day. This facilitates more rapid convalescence by improving the bowel function, appetite and morale.

3. Convalescent Care. Most surgeons discharge their patients when the proctologic condition for which surgery has been performed is alleviated. This dismissal may be made without consideration of the fact that the patient may

or may not be ready to resume normal function. In a word, there is no assurance of the future care of the patient by himself. This applies particularly to normal bowel function (without laxatives) or proper diet. "People seem averse to regulate the fundamentals of their lives such as eating, drinking, sleeping and evacuation of the bowel according to the dictates of right reason." It is during the postoperative period that attention to these aspects of convalescent care are most important since it will teach the patient proper habits, will hasten recovery and if continued indefinitely will ensure permanent health.

The immediate postoperative orders of a number of proctologists interviewed are as follows: On the day of operation, the patient is allowed either cracked ice, tapwater, beer, ice-cold ginger ale or weak tea. On the first postoperative day, a soft diet is prescribed and, after the initial bowel movement, the standard hospital diet. The impression was gained from these interviews that insufficient emphasis was placed on the long term bowel and dietary habits of the patient.

Comments on diet and long-term bowel management: Proper nutrition implies not only an adequate but an optimum diet. It is worthwhile, therefore, to emphasize to the patient the necessity of consuming a balanced diet all his life. This phase of surgery is particularly neglected. Most people do not know what constitutes an optimum diet. The well balanced diet for a patient after anorectal surgery should be high in protein, moderate in fats and low in carbohydrates. Citrus fruit juices are encouraged, coarse vegetables are prohibited and vitamin supplements are mandatory.

Noncarthartic treatment of constipation includes, among other recognized measures, treatment by diet. For this purpose, a diet containing fibrous foodstuffs in the form of fruit, vegetables and cereals to stimulate colonic peristalsis is advisable. Suggested are such fruits as stewed prunes and apricots, such vegetables as string beans, spinach, and asparagus and the inclusion of one whole grain cereal such as shredded wheat with perhaps a slice of whole wheat bread.

In any regimen for the treatment of constipation, adequate intake of water is essential to supply the means by which the fruit and vegetable pectens and galactans soften the feces.

The urge to move the bowel should never be ignored. The patient who has a desire to empty the rectum and is unable to do so, especially postoperatively, may be given a pint of normal saline or plain tap water enema or an enema of one of the synthetic wetting agents, later prescribed for impaction. There are also rectal suppositories to stimulate rectal peristalsis such as pharmalax, Dulcolax® or the simple glycerin suppository. The administration of a hydrogel or an aforementioned synthetic wetting agent improves bowel function postoperatively. These may be continued over a period sufficient for normal bowel function to be definitely re-established.

PART II

Part I contained a report of the Quadrangular Proctologic Convention. In it, consideration was given to the total welfare of the patient subjected to proctologic surgery with emphasis on surgical methods in general and postoperative care in particular.

In Part II, the operative management of more common anorectal disorders is presented; the surgical treatment of the more complex diseases of the colon and rectum is discussed, as well as the treatment of postoperative complications.

OPERATIVE MANAGEMENT OF COMMON ANORECTAL DISORDERS

Hemorrhoidectomy. Closed method (Parkinson's): The tissue at the anal verge is grasped with Pennington clamps. A circular incision is then made around the canal. A cuff of lower rectal mucosa is dissected free from the rectal muscle. This includes all hemorrhoidal and other pathologic tissue (Fig 2A.) The area of the anal crypts is next raised and the dissection continued out to the border of the subcutaneous external sphincter muscle, thereby forming a cuff of raised anal skin. The excess anal skin is excised. Next, the mucosa, with its contained hemorrhoidal tissue, is removed. The raised rectal mucosa is then grasped with several Pennington clamps and sutured distally to the border of the anal skin (Fig. 2B.)

The opinion was expressed that this was a modified Whitehead operation with the possi-

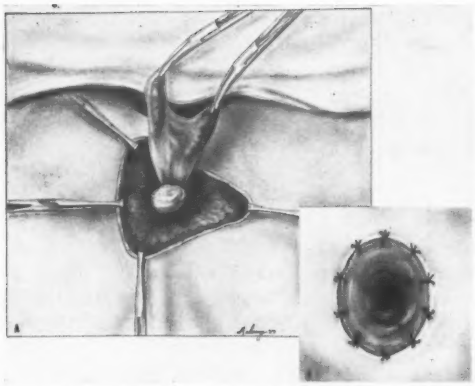

FIG. 2. Hemorrhoidectomy, Parkinson's closed method. A, a cuff of lower rectal mucosa is dissected free from the rectal muscle with a circular incision. B, the mucosa with its contained hemorrhoidal tissue is excised and the cuff of mucosa is sutured to the anal skin. (Illustration obtained from E. D. Parkinson, M.D., Boise, Idaho.)

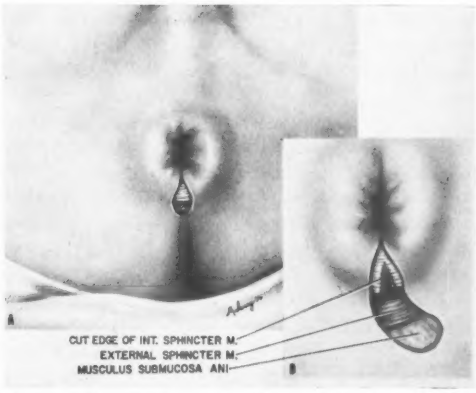

FIG. 3. Chronic fissure (anal muscles relaxed under anesthesia). A, longitudinal muscle fibers have ulcerated through, exposing the white circular fibers of the internal sphincter muscle. B, the internal sphincter muscle partially divided. The fibers of the subcutaneous external sphincter muscle when well developed may require division to prevent a "ridge."

bility of complications such as stricture or stenosis. The majority of the discussers favored the time-tested open method of dissection, ligature and excision of each hemorrhoid with adequate wound drainage.

Open method: The following refinement was suggested for the open method of operation: The raw wound left by the excision may be closed with advantage by one, two or three No. 3–0 plain catgut stitches which are carefully placed at the base of the wound from the hemorrhoidectomy. By this additional measure, the small vessels of the hemorrhoidal plexus which escaped the primary control suture are secured. Care is taken to exclude the internal or external sphincter muscle in the ligature or not to pinch the nerve supply to the muscle fibers in order to avoid postoperative pain.

The technic of hemorrhoidectomy recommended in the presence of a rosette of internal hemorrhoids was as follows: The prolapsed hemorrhoids with the associated mucosal prolapse are grasped in three artery clamps and divided into three portions corresponding in position to the three primary piles, left lateral, right anterior and right posterior. A short scissor cut is made at the mucocutaneous junction and each prolapsed portion is transfixed and doubly ligated with chromic catgut, allowing mucous membrane and skin between each. Adequate skin drainage should be instituted. This method was more satisfactory than the closed method because of less danger of infection and stenosis.

A number of suggestions were offered in the treatment of supplementary hemorrhoids remaining after the open technic of hemorrhoidectomy is performed. These are (1) simple running or lock stitch suture surrounding the hemorrhoids, (2) application of a clamp at the base with excision of excess tissue and obliteration of the pile with a continuous suture over or under the clamp and (3) a small incision is made at the dentate margin of the pile and a plain catgut tie applied around its base.

Fissurectomy. Morgan [1] and Eisenhammer [2] method: A local anesthetic is injected into and around the fissure bed. This relaxes the sphincters and brings into view the internal sphincter muscle. (Fig. 3A.) The muscle is then partly incised longitudinally, carrying the incision through the ulcer and out for a short distance for external drainage. (Fig. 3B.) Morgan is careful not to cut the internal sphincter entirely through, as he desires to leave a "bottleneck." Eisenhammer merely incises the internal sphincter muscle under the anal ulcer without any external drainage wound, and claims success in 300 patients.* The purpose of this procedure is to relieve sphincter spasm thereby placing the fissure bed at rest, thus

* Thompson [1] reported the same number with the same result.

permitting it to heal. This method created much interest because of its apparent simplicity.

Comment: A similar operation was advocated a number of years ago and was called after the originator "the method of Boyer" [3].

The majority of the proctologists favored the method of total excision of the fissure and any associated lesion or lesions together with a partial sphincterotomy of the sphincter muscles if these were prominent.

Abscess. Proctologists seemed to be in general agreement that it is poor practice to prescribe an antibiotic in order to abort an anal or perineopelvic abscess. It may mask the true nature of the infection or increase involvement of the neighboring tissues by sloughing, and thereby aggravate the primary condition.

A number of proctologists stated that they perform a one stage abscess fistulotomy, that is, if there is an internal opening it is united to the abscess cavity by incising it over a probe.

Fistulectomy. Accurate knowledge of the anatomy of the region is essential in the treatment of anorectal fistulas. Careful identification of the musculature at the beginning of an operation enables the surgeon to eradicate most fistulas without fear of producing incontinence. It is wise to avoid spinal anesthesia in most fistula operations. General anesthesia is preferred since it permits precise identification of the muscles by palpation.

The consensus was that fistulotomy with removal of the overhanging edges is preferred to fistulectomy. This is especially indicated in posterior anal fistula where the entire sphincter may be divided without producing incontinence since the puborectalis portion of the levator supplies sufficient support for the anal canal. A wound from fistulotomy heals by granulation tissue. It is seldom complicated by troublesome bleeding and rarely results in fecal incontinence; the postoperative pain is minimal and infection rarely follows the operation.

The two stage operation with seton is indicated for an anterior fistulous tract because the sphincter muscles are poorly developed and lack the supportive puborectalis muscle. In women, the anterior muscles are stretched and weakened during parturition. If a fistulous tract passes above the entire anorectal ring so that all the muscles must be divided in order to extirpate the tract, a two stage procedure is indicated. The tract is incised or excised to where it enters the lateral border of the muscle and a seton is placed around the remaining sphincter muscle. After approximately four weeks, as an office procedure, it is removed by incising the muscle over a probe under local anesthesia. At this time the external wound has healed sufficiently so that adherent scar prevents separation of the remaining muscle.

Pilonidal Cyst. The following principles were stressed by Hopping.* Incise pilonidal sinus along normal skin folds, not over the sacral bone. This means excise the sinus transversely. Langer's lines† indicate the line of incision. Leave all wounds open. Sutures in a wound help infection. Control bleeding by pressure and Gelfoam. A dry wound deters infection. Surface wounds which are water soaked (e.g., sitz baths) become macerated and infected and Hopping is not in favor of it in this procedure.

Buie's method of marsupialization was also discussed and recommended as a tried and proved method for the surgical treatment of pilonidal cyst and sinus.

PROLAPSE AND PROCIDENTIA

Rectal prolapse occurs mainly in two well defined age groups: (1) in children between the ages of a few months to a few years; and (2) in adults of advanced years. In infants two months to three years of age, an important causative factor is a straight pelvic outlet which favors mucosal prolapse. Prolapse is aggravated by poor fat malnutrition. Sigmoidal prolapse into the rectum is common in infants and children and often causes colic. During proctoscopy, the prolapse is clearly visible especially if the infant cries. Sigmoidoscopy is essential in both children and adults to exclude neoplasms and ulcerative disease.

A number of measures were recommended in the treatment of mucosal prolapse in children. In milder conditions, the child is urged to move the bowel in the left lateral Sim's position. In older children, a footrest added to the toilet seat is helpful. Another method involves fitting

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† Langer's lines. The grain is in the direction of normal wrinkles. The lines run obliquely and transversely, "wrinkle lines." The incision is through the skin and muscle in the direction of Langer's lines. This is a more anatomicophysiologic incision than a vertical incision. The result is a finer scar than is obtained with a vertical incision. Stress causes transverse wounds to appose instead of to gape.

a board with a small opening over the child's toilet seat. This gives mechanical support to the anus and prevents prolapse. A method which is frequently successful in the younger age group is the instillation at bedtime of 60 cc. warm Mazola or mineral oil as an overnight retention enema. Strapping the buttocks together aids retention of the oil. If these measures are ineffective, electrothermal scarification of the mucous membrane in each of four quadrants is recommended.

As an alternative to linear cauterization, the fixation of the relaxed mucous membrane to the muscular wall of the rectum may be achieved by the injection of 5 per cent phenol in almond oil submucously. The technic is similar to that employed for the injection treatment of internal hemorrhoids except that 5 to 10 cc. of oil is used.

Treatment of Mucosal Prolapse of the Rectum in Adults. This was divided into two categories, those with normal sphincter tone and those with sphincter atony. In the former, since most subjects are of an advanced age, the treatment suggested as least hazardous to the patient was as follows: Local anesthesia is administered. The prolapsed mucous membrane is taken in three artery clamps and divided into three portions corresponding in position to the three primary piles, left lateral, right anterior and right posterior. A short scissors cut is made in the mucocutaneous junction and each portion is transfixed and doubly ligated with chromic catgut, allowing mucous membrane to remain between each mass. It was agreed that in adults with mucosal prolapse and sphincter relaxation the treatment is more difficult. Several methods were recommended. One required the injection of 6 to 8 cc. of 5 per cent phenol in almond oil submucously, intrarectally an inch above the dentate line, in each lateral and posterior quadrant for a total of 24 cc. of the solution. The object of the sclerosing therapy is to induce a chemical inflammatory reaction which will retain the prolapse in and above the rectum by the artificial creation of a supporting fibrosis.

Comment: A method which I have described [4] previously and which is applicable to both a large rectal mucosal prolapse and rectal procidentia involves the injection of sclerosing solutions *submucously* and *perirectally*. The results are often satisfactory.

Procidentia. During the discussion period of rectal prolapse, several instances in boys thirteen to fifteen years of age with adult type of procidentia were reported. The initial treatment was usually sclerosis with 5 per cent phenol in oil or 5 per cent quinine urea hydrochloride. The result was unsuccessful for a long term cure. The opinion was expressed that in such instances and especially when the sphincter tone was markedly atonic, internal fixation of the procidentia with or without amputation as in the adult was the operation of choice. The Thiersch operation was not recommended for this age group.*

The Thiersch operation: Procidentia implies a circular descent or invagination of the rectum with all its coats through the anus. In the aged with this condition, there is usually complete loss of tone of the levator and sphincter muscles. The Thiersch operation for procidentia is recommended in these patients and those who are too feeble and whose general condition is too poor to permit a more extensive operation.

The classic Thiersch operation consists of surrounding the anus with a ring of silver wire which is passed around the perianal space in order to narrow the anal outlet. This operation immediately prevents external procidentia with its disagreeable fecal soilage.

The following were some of the suggestions made in order to improve on this operation: (1) To assure strict asepsis the patient should receive an antibiotic or sulfonamide medication pre- and postoperatively for several days; (2) the wire should be placed ½ inch deep to the skin to avoid ulceration. If too superficial, the tendency is for it to protrude through the anal skin; and (3) Marino† inserts two wires, the second one about 1 cm. deeper than the first and about 1.5 cm. apart in order to fashion an artificial anal canal. The following are some of the wire gauges recommended and the methods of insertion: a No. 26 to 28 gauge braided steel wire inserted through a straight bore needle; a No. 30 braided steel wire inserted through a Riverdin ligature carrying needle; and a steel tonsil wire No. 26 to 28 gauge inserted with a flexible 3½ inch needle or a good-size Trocar needle. However, the consensus was that a No. 20 gauge standard silver wire inserted with

* Maurice Kagan (Hackensack, New Jersey) recently performed a Thiersch operation on a two month malnourished infant with procidentia. The only complication was an occasional impaction. The wire was removed after fourteen months and apparent cure was achieved.

† A. W. Martin Marino, Brooklyn, New York.

the Doyen type needle was the best and least likely to break through stress (cough) or straining.

Infection is a complication indicating the immediate removal of the wire. Rupture of the wire also requires removal. A new wire is reinserted at a later date.

The description of the Thiersch operation is omitted in order to conserve space. The following references may be consulted [5–7].

Impaction is the most common complication of the Thiersch operation. Preventive measures include frequent postoperative digital examination of the rectum and frequent Sigmol or Fleet enemas until the bowel movement is regulated. Colonic peristaltic stimulants such as those previously mentioned (Peri-Colace, Doxinate® with danthron, Glysennid® and Dorbantyl®) may also be administered early in the postoperative period in order to avoid impaction.

CARCINOMA AND POLYPOID DISEASE

The following conclusions and recommendations were noted during the consideration of polypoid diseases and its relation to carcinoma of the rectum and colon.

Adenocarcinoma constitutes approximately 90 per cent of all cancers of the rectum and colon. Clinical experience and investigative studies indicate that 30 per cent of carcinomas of the colon have their origin in adenomas. These in turn arise in a localized hyperplasia of the glandular epithelium within the mucous membrane of the rectum and colon. Fifteen per cent of polyps found in the colon are already malignant. Adenomas have a peak incidence in the rectum and in the lower portion of the sigmoid. These are accessible to detection and removal through the sigmoidoscope. Polyps are found twice as frequently by sigmoidoscopy than by roentgenographic examination. Exploratory colonotomy has a low incidence of mortality and is indicated in all suspected cases of polyps, especially when there is constant or persistant rectal bleeding not explained otherwise when barium enema is also negative. At least two barium enemas with air contrast should show the polyp of the colon before a definitive diagnosis is made. Surgical exploration with palpation for polyps is uncertain particularly in inexperienced hands. Sigmoidoscopic examination through a colonotmy should be performed in each suspected case. Sessile adenomas are much more prone to malignancy than pedunculated polyps. A patient with a polyp should be followed up throughout his lifetime.

In a further discussion of the treatment of polypoid disease of the rectum, the following pertinent notes were obtained. Total electrothermal biopsy of an adenoma also requires that a cuff of 3 mm. of mucosa around the polyp be excised. A small polyp should be coagulated. A pedunculated polyp should be excised with the electric snare and if, on biopsy, the pedicle is free of malignant foci, further surgery is not indicated. A polyp which is not freely movable and has a fixed base is highly suspect of malignancy and is a surgical problem. In a patient with multiple polyps, the indicated treatment is colectomy. An adenoma situated above the peritoneal reflection of the rectum should be removed intra-abdominally since there is always the possibility of perforation into the peritoneum during cautery snare excision. This is apt to occur especially with a lesion on the anterior wall of the bowel. The removal of an extremely large sessile polyp of the rectal ampulla, whether situated anteriorly or posteriorly, may require incision through the entire sphincter musculature posteriorly to attain adequate operative exposure. Subsequently, the sphincter muscles are accurately repaired.

The treatment suggested for bleeding following the removal of a polyp consists of (1) electrocoagulation of the bleeding polypectomy site, (2) a solution of thromboplastin with adrenalin or Monsel's solution applied directly to the bleeding area and (3) Premarin® intravenous, as a superior coagulant. Twenty mg. of Premarin, injected intravenously, will usually result in an immediate response. If bleeding recurs within one hour, the dose may be given again. The coagulants mentioned under postoperative hemorrhage are also recommended in the treatment of this complication.

CHRONIC NONSPECIFIC ULCERATIVE COLITIS

Surgical Aspect. Indications for colectomy were the following: fulminating cases, intractable diarrhea, anal fistula, anal incontinence, carcinoma, extensive contraction and stricture, and chronic invalidism. Primary resection of the colon was advised because it relieves the patient of all active disease and its complications. The opinion was expressed that ileostomy alone is rarely indicated, since a pa-

tient who is sick enough for an ileostomy is sick enough for colectomy. A valuable drug for use in the hospital in acute cases is ACTH; it is dangerous to use at home because there is always the danger of perforation or hemorrhage.

NONSPECIFIC ULCERATIVE PROCTITIS

The recommended treatment was by the rectal instillation of 5 to 10 mg. of prednisolone or Meticortelone® acetate dissolved in 100 cc. normal saline solution. This is administered as a retention enema by means of an infant-type rubber bulb syringe. The dose may be gradually increased to 15 to 25 mg. of the steroid several times daily and in severe cases as much as 40 mg. may be instilled twice daily. It was claimed that there is usually rapid subjective improvement. Within a few days, sigmoidoscopic examination reveals gross evidence of healing. The treatment relieves rectal bleeding, purulent discharges, tenesmus, perianal irritation and excoriation. Instillations, it was stated, do not produce adverse systemic effect even in high concentration. It is indicated especially in very ill patients, in pregnancy and in juvenile patients. The strength of the solution is gradually reduced until finally the maintenance dose of 5 mg. of the steroid is instilled every other day for several months in order to prevent recurrence. It was stated that there was no contraindication to its use over a prolonged period.

The steroid may be administered as a drip into the rectum with the use of a blood transfusion-giving set modified to carry a rubber catheter (Truelove). Rectal suppositories containing steroid medication are available commercially. Protef® suppository contains hydrocortisone acetate, 15 mg. and neomycin, 15 mg. It is especially effective in the mixed type of ulcerative proctitis.

PART III

Postoperative Complications

There are certain proctologic surgical principles which must be observed in order to minimize *postoperative complications*. The same diagnostic care, adherence to anatomic zones and gentleness in handling tissues, as employed in other areas of the body, are indicated in the anorectum. The basic concepts of surgical technic and postoperative care, including local care of anal wounds, previously described should be followed. The patient should be kept under close observation until complete recovery satisfactory to the patient and the surgeon is assured.

The following postoperative anorectal complications are discussed herein: (1) hemorrhage, (2) fecal impaction, (3) postoperative infection, (4) postoperative benign stricture, (5) perianal edema, (6) perianal abscess, (7) urinary retention and (8) postspinal headache. The treatment of these complications recommended during an interview with a number of proctologists is included.

HEMORRHAGE

Chief among the early complications of anorectal surgery is postoperative hemorrhage. Hemorrhage occurring in the first few hours following surgery is usually the result of active bleeding from one or more arteries as indicated by rising pulse and blood-soaked dressing. It is treated in the operating room by ligating the bleeding vessel. When profuse bleeding from the hemorrhoidal stump occurs within the rectum at a later date, as indicated by rapid pulse, pallor and passage of a large amount of clotted blood, it is difficult to control. The following methods were suggested: Rolen's or Buie's method of tamponage with an "accordion pack." This consists of a long gauze strip placed within the rectum by means of long thumb forceps through a proctoscope. It carries a linen or silk thread "lacing" which when pulled taut causes the gauze to form a snug ball or tampon immediately proximal to the bleeding area. A large gauze roll is placed against the anal and perianal tissues. The long ends of the lacing are tied firmly around the gauze roll. The anorectal tissues are thereby firmly splinted between the two masses of gauze. The pack is removed in thirty-six to forty-eight hours by cutting the tied lacing and gently withdrawing the gauze from the rectum.

Secondary (massive) hemorrhage into the rectum proper usually occurs between the seventh and tenth postoperative day from exposure of an artery following the slough of the hemorrhoidal stump and the slip or early separation of a ligature. The method of treatment recommended was by the use of a Foley type 26 F catheter. After insertion into the rectum

it is blown up with 30 cc. of water. A similar method involves the use of a Bardex bulb which is then inflated with air. In either instance, with firm pressure exerted on the anorectum, the catheter is taped tightly to a buttock.

The following treatment was suggested for a variety of lesser degrees of secondary hemorrhage: Mephyton® emulsion, a brand of vitamin K, is indicated when hypoprothrombinemia is a cause of bleeding. It is administered by slow intravenous injection. Mephyton tablets, 50 mg., may also be given orally, pre- and postoperatively, as an aid to control imminent or further bleeding. Koagamin,® an aqueous solution of oxalic and malonic acids with 0.25 per cent phenol, is also recommended for use both intravenously and intramuscularly when the source of bleeding is not obvious.

FECAL IMPACTION

Fecal impaction may occur early or late in the patient's postoperative course. The following prophylactic measures were recommended: (1) full-house diet, including fruits and salads, the first postoperative day; (2) one of the synthetic wetting agents (Peri-Colace) prescribed the same day; (3) copious quantities of diluted fruit juice, to one quart or more daily, besides the usual liquids; (4) instillation of 1 or 2 oz. warm Mazola or mineral oil as a retention enema with a small rubber catheter and asepto syringe beginning the evening of the second postoperative day; and (5) insertion into rectum of one or two Dulcolax suppositories is also effective.

Rectal pressure, tenesmus and fecal leakage usually indicate fecal impaction. Early awareness of this complication and frequent digital rectal examination are recommended as precautionary measures.

The following active treatment of postoperative fecal impaction was recommended by a number of proctologists. An attempt is made to disintegrate the fecal mass digitally; then 5 cc. of a 1 to 5 per cent solution of Aerosol® OT (dioctyl sodium sulfosuccinate) in 1 or 2 oz. mineral oil, or 2 dr. Doxinate solution in 4 oz. water, or 4 oz. Sigmol enema is instilled into the rectum as a prolonged retention enema. Fleet enema was also recommended. It is advisable that these medications be instilled into the rectum with the patient in the knee-chest or elevated hip position and retained in the left lateral or supine position until there is a strong urge to evacuate.

A warning was voiced against the use of a peroxide enema for fecal impaction. It was stated that it is extremely irritating to the mucosa and causes multiple ulceration and even hemorrhage.

POSTOPERATIVE WOUND INFECTION

The organisms which commonly cause postoperative wound infection are the coliform bacilli, Streptococcus, Streptococcus hemolyticus, Staphylococcus aureus, and the mycotic organisms, yeast and Monilia. The varied etiology emphasizes the importance of cultures for identification of the organism and tests for antibiotic sensitivity.

The recommended treatment for this complication was a locally acting sulfa preparation, such as Sulfasuxidine, and an appropriate antibiotic as determined by sensitivity test of the causative organism.

Comment: The relative sterilization of the large intestine after prolonged use of the antibiotic preparations is a calculated risk. There is a possibility of overgrowth of the resistant Staphylococcus aureus and the consequent enterotoxemia with all its potential dangers.

POSTOPERATIVE BENIGN STRICTURE

The removal of internal piles, the Whitehead operation, or extensive operation for fistula may be followed by a greater or lesser degree of fibrosis and contraction. This is especially the case after large denuded areas of tissue are left following separation of sutures between mucous membrane and anal skin or after sloughing of tissues. Stenosis is also apt to occur if insufficient mucosa or perianal skin is left. Postoperative infection following anorectal operation is a frequent cause of anal stenosis or stricture. Usually the contracture appears at the anal verge or about 1½ inches above the dentate line. It may involve part or the whole circumference of the anorectum.

In the discussion of this complication it was the opinion of several proctologists that a stricture will frequently soften in the absence of infection or diarrhea.

The pertinent facts are as follows: In the healing of wounds by granulation, excessive fibrous and vascular elements are present in the early hypertrophic scar. In time, six months or longer, Howes [8] observed that excessive

fibrous tissue and vascular elements are partially absorbed during differentiation of the scar. This is dependent upon the absence of infection and maintenance of normal (bowel) function.

Preventive and Palliative Treatment of Benign Stricture. Important factors during the postoperative period include: (1) avoidance of extensive wound infection, (2) gentle passage of a finger into the rectum every third day and (3) dietary management which results in a daily formed stool. Should inordinate contraction occur, daily dilatation by the patient or a close relative is instituted after injecting an oil soluble anesthetic into the perianal tissues.

Operative Treatment. 1. Anal stenosis: It was recommended that annular scar tissue be incised in the midline both posteriorly and anteriorly until adequate room has been established in the anal canal. In anal stenosis, the internal sphincter muscle is incised (as in fissurectomy) and also the subcutaneous external sphincter muscle if it is prominent (Eisenhammer [9]). The patient is then given a dilator of suitable size and instructred in its daily passage over a prolonged period.

2. Rectal stricture and internal proctotomy: The indication for this operation is in the case of a small annular stricture with a well marked diaphragm. The stricture is partly divided by means of a cautery scalpel, guided by a finger in the rectum. The divisions should be made posteriorly and laterally and followed by gradual dilatation with bougies.

POSTOPERATIVE PERIANAL EDEMA OR HEMATOMA

The recommended treatment for these conditions was as follows: (1) Subcutaneous injection of 1 cc. of 150 units of Wydase® (hyaluronidase), repeated if necessary, thereby eliminating surgical intervention. (2) Chymoral (Armour), two tablets four times daily, then reducing dosage to one tablet four times a day for maintenance. (3) Also recommended was Butazolidine,® 200 mg. three times a day for three days, to suppress inflammation, relieve pain and to shorten the disability period (Salvati).

PERIANAL ABSCESS

This complication, although infrequent, was discussed because of its unexpected onset with acute local and generalized symptoms and without any apparent relation to the operative procedure. It may occur two to three weeks following an anorectal operation.

The pathogenesis of the abscess which usually develops in the para-anal tissues has received a number of explanations in the past. However, in the light of present day experience with the Staphylococcus organism as a postoperative surgical complication (wound infection, enteritis) as a result of antibiotic therapy, an acceptable explanation of the cause of para-anal abscess may be based on the use of these drugs pre- and postoperatively.

In order to avoid this complication, it was suggested that the routine use of a broad spectrum antibiotic pre- and postoperatively should be discontinued and, if indicated, one of the sulfonamide preparations be prescribed since they are less apt to suppress the coliform and other normal bacterial inhabitants of the colon.

Comment: Repeated recurrence of a para-anal abscess occurs, occasionally in spite of appropriate treatment. Under these circumstances, an autogenous vaccine from the predominant gram positive organism may be required to effect a cure. However, a vaccine can only be made from a gram positive organism. A gram negative organism is not suitable primarily because of its antigenetic action. A good result depends on graduated, fractional dosage.

POSTOPERATIVE URINARY RETENTION

The following were suggested as probable causes of urinary retention: spinal anesthesia with the resulting temporary paralysis of the bladder; reflex spasm of the bladder detrussor muscle due to surgical trauma of the perianal sensory nerves; and the packing inserted into the anal canal postoperatively which is a frequent cause. The packing is also a frequent cause of postoperative pain which, in a nervous subject, further aggravates the condition. The absence of anal packing will often insure a normal passage of urine postoperatively.

A number of suggestions were made in the treatment of urinary retention, such as a hypodermic of Prostigmin® methylsulfate, 0.25 to 0.5 mg., intramuscularly, every two to four hours. Ilopan,® a *d*-pantothenyl alcohol, was also highly recommended hypodermically in dose of 2 cc. (500 mg.), repeated if necessary at

two and six hour intervals. In the older age group with prostatism, prophylactic catherterization with the Foley catheter was advised preoperatively. Bourland prescribes 12 oz. of beer every two to four hours until the patient voids.

POSTOPERATIVE SPINAL HEADACHE

The following medications were suggested: Cafergot® tablets, one or two tablets four times a day. Caffeine sodium benzoate, 7½ gr., dissolved in 300 cc. physiologic saline solution administered intravenously every twelve hours. An effective treatment for postspinal headache is the intravenous infusion of alcohol, 5 per cent, in 1,000 cc. of 5 per cent glucose in water or Vitadex-B® in alcohol (Cutter). The solution should be given at full speed so that the patient becomes partially inebriated. Administration is then slowed to 40 to 60 drops per minute for the duration of the infusion. As a rule, relief is obtained with the first infusion although it may be repeated in twenty-four hours.

SUMMARY

A variety of opinions expressed by a number of proctologists regarding diseases of the anus, rectum and colon and their treatment are incorporated in these proctologic notes. Also included is a brief résumé of the newer concepts of anorectal anatomy.

Details of postoperative care of the surgical patient as practiced by various proctologists is described. Convalescent care, a neglected subject, is discussed in order to enable the surgeon to guide his patients in securing optimum health, especially as it relates to diet and long term bowel regulation.

The various technics employed by proctologists in hemorrhoidectomy, fissurectomy, fistulectomy and pilonidal cyst are briefly reported. The surgical treatment of the more complex diseases of the colon and rectum such as procidentia, carcinoma in polyps, and nonspecific ulcerative colitis is discussed.

The more common postoperative anorectal complications are enumerated and treatment suggested. In order to avoid these complications, the basic concepts of surgical technic and postoperative care, including local care of anal wounds, previously described should be followed. The patient should be kept under close observation until complete recovery satisfactory to the patient and the surgeon is assured.

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CASE REPORTS

Cystadenoma of the Pancreas

REPORT OF TWO CASES

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CYSTADENOMA of the pancreas is an uncommon lesion. Fifty-six cases were reported before 1951. Large series of patients with this lesion will not be seen by any one surgeon, and the report of two cases of extremely large cystadenomas with special attention to the surgical problem is believed to be worth recording.

CASE REPORTS

CASE 1. E. S., a fifty-seven year old white single woman, had lower abdominal pains, on standing, about three weeks prior to admission. These pains became so severe on prolonged standing that the patient was required to lie down to obtain relief. About four days prior to admission constant pain developed just below the tip of the left scapula. One day before admission she had constant, severe lower abdominal pain which was most marked in the left lower quadrant. There was no nausea or vomiting.

Physical examination revealed the following positive findings. On admission, there was diffuse abdominal tenderness with rebound tenderness all over. There was moderate muscle spasm, making palpation of the abdomen somewhat unsatisfactory. There were normal bowel sounds. Three days after admission the generalized abdominal tenderness had disappeared and it was apparent that there was a smooth rounded nontender mass in the left upper quadrant in the midclavicular line, extending just below the costal margin. This mass was attached posteriorly. It could be moved quite readily and it moved down on deep inspiration.

Laboratory findings obtained on admission were as follows: urinalysis was within normal limits; hemoglobin, 12.7 gm. per cent; and white blood cell count, 7,750 per cu. mm. Differential blood count indicated 75 per cent segmented polymorphonuclear leukocytes, 2 per cent stabs, 3 per cent juveniles and 20 per cent lymphocytes. Blood urea nitrogen was 2 mg. per 100 ml. and serum amylase 92 units.

Results of roentgenographic examinations were as follows: Examination of the abdomen on admission showed no free air under the diaphragm and no significant abnormalities were noted. Intravenous pyelogram showed only reduplication of the left kidney with two ureters. Examination employing a barium enema showed a normal colon.

At the outset of the hospital course it was elected to observe this patient; after three days, the acute abdominal findings disappeared and it was then apparent that the patient had a left upper quadrant mass. The intravenous pyelogram ruled out a renal source for this lesion and the barium enema also was negative. It was believed that further diagnostic studies would be redundant; thus the patient was scheduled for exploratory laparotomy one week after admission.

Through an upper transverse abdominal incision, a large cystadenoma of the tail of the pancreas was removed and splenectomy also was performed. She tolerated the operation well. Postoperative course was complicated by the development of a fever one week after operation. A few days later pain developed at the base of the left side of her neck (in the left supraclavicular region) and shoulder, and tenderness developed over the lower left side of the rib cage. Chest x-ray films showed the diaphragm high on the left side and widening of the space between the gas bubble of the stomach and the superior border of the left side of the diaphragm. Fluoroscopic examination showed excursion of the diaphragm on the left side to be markedly restricted. It was thought that an abscess in the left subphrenic space had developed. Exploration was

carried out through the lateral half of the previous incision and numerous dense adhesions with much indurated tissue were found in the left upper quadrant; the stomach was markedly pulled over into the splenic bed and adherent to the diaphragm. Several small accumulations of clear bile-stained fluid were found in the region of the under surface of the diaphragm. Drains were placed in the left subphrenic space and the patient's subsequent course was one of steady improvement. The wound healed without complications and she was discharged on November 19, 1959.

The pathology report stated that grossly the mass consisted of a rubbery smooth grayish red tumor measuring 15 by 6 by 5 cm. When sectioned, the tumor represented a cyst with a rigid grayish wall which was no more than .3 cm. thick. The cyst was biloculated. Of the bilocular compartments, one had a smooth lining and watery straw-colored contents. The other had similar contents but exhibited a number of hazel nut-sized and large olive-sized cauliflower-like brownish protrusions arising above the inner surface. They were semi-soft and well defined. There was also some mushy grayish brown material in this compartment. The two compartments were separated from each other by a thin fibrous septum.

Microscopic examination of sections showed a fibrous cyst wall containing occasional remnants of Langerhans' islands and of regular pancreatic tissue. A few somewhat dilated ducts were noted to be lined with somewhat attenuated regular epithelium. The cyst lining proliferated into numerous glandular, but generally long slender papillary arrays with fibrous cores that were lined with rows of tall columnar cells with a pale pink cystoplasm and vesicular nuclei. The cell borders were quite distinct and the nuclei were fairly uniform. No break through the lining was encountered anywhere. Round cell infiltration was quite pronounced. The final diagnosis was papillary cystadenoma of the pancreas with postoperative left subphrenic cellulitis. (Fig. 1.)

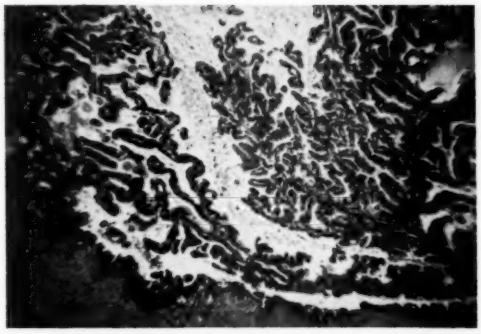

FIG. 1. Case 1. Cystadenoma of pancreas, papillary type, showing cyst wall and papillary protrusions.

CASE II. F. Z., a fifty-three year old white married woman, had a severe ache in the lower part of her back about one month prior to admission. She was treated conservatively and did improve. Two weeks prior to admission she again consulted her physician because she did not feel well generally. There were no specific complaints.

Physical examination revealed the following positive findings: In the left upper quadrant in the midclavicular line, there was palpable a firm smooth round mass, projecting below the costal margin, which measured at least 15 cm. in diameter. The mass moved down on deep inspiration. It could be moved slightly from side to side and seemed to be attached posteriorly.

Laboratory findings were as follows: Urinalysis at the time of admission showed a 1 plus albumin and 60 to 80 red blood cells. The result of a repeat urinalysis was negative. On admission, the hemogram showed hemoglobin 9.9 gm. per cent and a white blood cell count of 4,350 per cu. mm. Differential blood count indicated 71 per cent segmented polymorphonuclear leukocytes, 28 per cent lymphocytes and 1 per cent eosinophiles. Hematocrit was 35 per cent, blood urea nitrogen was 9.9 mg. per 100 ml. and the result of the Mazzini serologic test was negative.

Roentgenographic examinations showed the chest was normal and a pressure defect against the splenic flexure in the colon. Upper gastrointestinal barium study showed displacement of the stomach anteriorly and slightly medially. Intravenous pyelogram showed a questionable defect in the right renal pelvis and this was further investigated with retrograde pyelography which was normal. A small papilloma was seen at cystoscopy at the left ureteral orifice, and this was later removed.

The hospital course was as follows: After studies were completed, the patient was taken to the operating room on December 9, 1958, for exploratory laparotomy. Through a combined thoracoabdominal incision, a large cystadenoma of the pancreas was removed and also splenectomy was performed. The patient tolerated this operation well. The wound healed without complications and the patient was discharged on December 23, 1958. A short time later she returned to the hospital for drainage for an abscess in the left subphrenic space. At the present time she is well.

The pathology laboratory reported that the spleen weighed 342 gm. with a large grapefruit-sized grayish mass attached to the under surface of the spleen. The mass fluctuated when pressure was applied. On opening, the mass was composed of a multilocular cyst which contained soft grayish brown nondescript friable masses and grayish

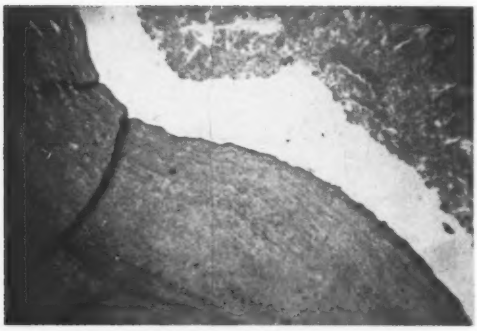

FIG. 2. Case 11. Cystadenoma of pancreas, simple, showing thick wall with smooth thin lining and pasty contents.

green partially liquid and partially pasty material. The main wall of the cyst was generally about .5 cm. thick. The external surface was smooth. Anteriorly on the external surface, however, a silver dollar-sized portion of somewhat lobulated tan brown tissue was attached. The inner lining of the cyst was smooth everywhere. The compartments were separated by thin fibrous septa. The attached spleen was smooth purplish gray and had a somewhat congested pulp. Because of the type of attachment of the spleen to the cyst, the status of the splenic vessels could not be explored reliably.

Microscopic examination of sections showed a fibrous cyst wall containing remnants of typical pancreatic tissue with Langerhans' islands. A very rare characteristic ductal structure was seen. On the outer surface, typical and characteristic pancreatic tissue was again encountered in one area. The inner lining of the cyst was somewhat wavy, but was smooth everywhere. Generally it was sloughed off. In one or the other fields, it could be recognized, however, as a low columnar lining with uniform cells that were well defined. The cyst contained structureless pasty material. There was heavy focal round cell infiltration in the cyst wall. The spleen exhibited conspicuous fibrosis of the intersinusoidal tissue. There was reticulum hyperplasia and in general the follicles were small; also they were diminished in number. The arterioles were thickened. The trabeculae were somewhat widened and fibrous. Otherwise, there were no pertinent changes. The final diagnosis was simple cystadenoma of the pancreas with postoperative left subphrenic abscess. (Fig. 2.)

GENERAL PATHOLOGICAL CONSIDERATIONS

The etiology and pathogenesis have been concisely presented by Glenner and Mallory [1]. They demonstrated that the duct cell of the pancreas is the cell of origin of this tumor. The tumor may be grossly cystic or grossly solid with smaller cystic spaces in it, but in all instances, it is believed that the duct cell contains the basic defect, and that the gross conformation of the lesion depends on its site of origin within the gland and subsequent mechanical and physical factors in its expansion. Other authors think that the solid adenomas are derived from the acinar cells. The cystic adenomas, making up 96 per cent of these tumors, are of concern to us.

Although the simple cystadenoma is more common (64 per cent), some of them must be classified as papillary cystadenomas because of epithelial-lined papillary ingrowths into the cystic spaces in the tumor. These papillary tumors have the same worrisome precancerous connotation or at least the malignant potential of other papillary tumors, such as are seen in the ovary and thyroid.

The simple cystadenomas arise more commonly in the body or tail of the pancreas and occur more often in female patients. They vary greatly in size, and may reach 18 cm. in diameter. The tumors usually are present behind the gastrocolic ligament, but may appear behind the gastrohepatic ligament, behind the stomach or even in the transverse mesocolon. They may be grossly lobulated, but the large ones usually have smooth surfaces. They are well encapsulated, but important structures such as the superior mesenteric and splenic vessels may be tightly stretched over the tumor surface. On cross section, the wall varies in thickness, being extremely thin in places, and is made up largely of the fibrous pseudocapsule around the tumor. They are usually multilocular. The cyst content varies from thin cloudy fluid to thick chocolate brown mucoid material. All three pancreatic enzymes reportedly have been found in these cysts. On microscopic examination, cystic spaces lined by low cuboidal, cuboidal, or columnar epithelium are apparent. If papillary processes are formed, the tumor is designated a papillary cystadenoma.

GENERAL CLINICAL FEATURES

The symptoms are generally those which might be expected of a slowly expanding upper abdominal mass. There may be no symptoms. The patient may feel the mass herself. There may be fullness, pain in the abdomen or back

or if the tumor should be one arising in the head of the pancreas, jaundice may occur [2]. The physical examination may not indicate a tumor if it is small. Examination may reveal a round smooth nontender mass usually in the upper abdomen and most commonly in the left upper quadrant. In both of our patients, the mass moved down on deep inspiration. Fluctuation has been noted.

Laboratory examinations are not helpful diagnostically. There were no pathognomonic data available from the laboratory.

Roentgenographic studies are of assistance mainly to rule out kidney lesions. Barium enema and upper gastrointestinal barium examinations localize the lesion. Rarely the cyst wall may be calcified and, therefore, demonstrable on plain films of the abdomen [3].

TREATMENT

The treatment is surgical extirpation. Recognizing that this lesion is a true neoplasm and realizing further that the papillary cystadenomas have a definite malignant potential, one is immediately directed away from the various drainage procedures as utilized in treating pseudocysts of the pancreas. Good surgical principles further demand that the site of attachment of the tumor be removed with it, and this is best accomplished practically by removing the body and/or tail of the pancreas with the tumor as indicated by the site of origin. It is further recommended by one of us (J. B. M.) on the basis of these two cases that careful scrutiny be applied to the splenic vein. In case of injury to it or evidence of splenic vein thrombosis, it is recommended that splenectomy be performed to prevent the later complications of splenic vein thrombosis, such as esophageal and gastric varices and Banti's syndrome.

COMMENTS

These two women presented grossly different symptoms, one having vague nonspecific complaints, and the other was admitted with an acute condition of the abdomen. However, the physical findings of a smooth slightly mobile nontender large mass projecting below the left costal margin in the midclavicular line and moving down on inspiration were so unique as to enable the surgeon to make the proper diagnosis clinically in the second case.

The stretching of the splenic vein over the expanding mass caused thrombosis of the vein in both of these patients. It is important to recognize that this occurs because in both cases the changes of lienal fibrosis, splenomegaly and esophago-gastric varices all due to hypertension in the splenic part of the portal system were far advanced. In case of any doubt about the state of the splenic vein, splenectomy should be performed.

In planning the operation for these large tumors in the left upper quadrant, it is important to have the operative field prepared and draped so that the incision can be extended into the left side of the chest if necessary, to obtain exposure. In the first case, the operation was managed easily through a transverse upper abdominal incision. In the second case, it could not have been completed without the thoracoabdominal incision as it allowed safe access to the splenic vessels and the large collateral venous circulation in the region of the upper pole of the enlarged spleen.

Histologic examination only can determine the benignancy or malignancy of these lesions. Therefore, it should be emphasized that the surgeon should perform a tumor operation based on good surgical principles. These cystadenomas have a relatively small region of attachment to the pancreas. The major part of the mass shells away from adjacent structures, and the unwary may shell the cyst off the pancreas, too. The pancreatic attachment should be sought for and resection of this portion of the pancreas carried out. As most of these tumors arise in the body or tail of the pancreas, it is usually most practical to remove the remaining distal pancreas with the lesion and its attachment.

Anyone familiar with abdominal surgery and especially with the removal of such space-occupying masses realizes the problem that presents itself postoperatively. When one visualizes the extensive empty cavity that is left after removal of such a lesion, one must then immediately recognize the difficulties that arise in filling such a cavity. Surrounding viscera, blood, exudate and most likely some pancreatic enzymes fill the cavity; thus, a fertile soil for bacterial growth is created. Sooner or later clinical infection ensues. The cavities of both patients were drained, and both received broad spectrum antibiotics. A still more vigorous approach such as use of a sump pump

seems to be indicated in obliterating more quickly the cavity left at the operative site.

SUMMARY

Two cases of cystadenomas of the pancreas successfully removed surgically are reported. The pathology and pathogenesis are briefly reviewed as well as special features of operative technic.

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An Unusual Internal Hernia

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INTERNAL hernias are encountered infrequently in abdominal surgery. They mimic many pathologic intra-abdominal conditions, and diagnosis prior to operative intervention is difficult. Within the past twelve months two unusual cases of internal hernia have been treated in this hospital. In one case the preoperative diagnosis was acute cholecystitis and in the other case, acute appendicitis. An omental defect was found in both through which a distal portion of the omentum had herniated with resultant infarction. The location of the infarcted omentum produced the signs and symptoms of the disease for which operation was performed.

CASE REPORTS

CASE I. J. P., a twenty-six year old student, was in good health until one month prior to admission. At that time, he first noticed an intermittent, mild, aching pain in the upper abdomen which was unrelated to position or time. This pain did not radiate and was unaffected by oral intake. It occurred three times within twenty-four hours, and then the patient was free of symptoms until four days prior to admission. Then a dull, aching pain again spread across the entire upper abdomen. After several hours the pain was relieved spontaneously. At 3 A.M. on the day of admission the patient was awakened by severe pain in the right upper abdominal quadrant. This remained localized and continuous and was aggravated by deep inspiration and body motion. No gastrointestinal or urinary symptoms were present. Initial examination showed the patient to be in marked distress because of pain. He was afebrile and his pulse was 90. Respirations were shallow, but examination of the chest and lungs showed no abnormalities. The abdomen had a normal contour. There was voluntary rigidity and rebound tenderness of the abdominal wall in the right upper quadrant. Bowel sounds were hyperactive.

The leukocyte count was 13,000 per cu. mm. with 63 per cent polymorphonuclear leukocytes. Urinalysis and roentgenograms of the chest and abdomen were not remarkable. The serum amylase was normal.

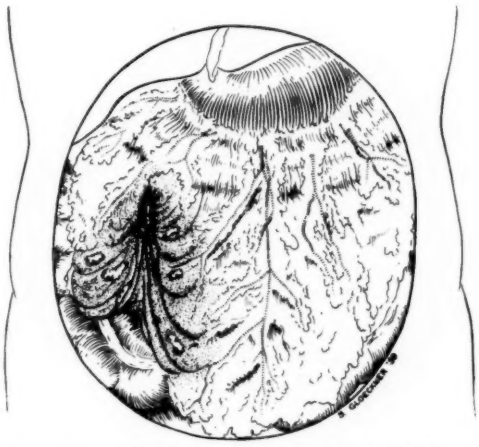

FIG. 1. Note defect in the omentum with herniation of the distal free edge of the omentum and resultant infarction.

Shortly after admission, the pain subsided spontaneously. Twelve hours later the leukocyte count was 7,000 per cu. mm. A gastroduodenal examination was within normal limits. Cholecystography showed non-visualization of the gallbladder. A few hours later, the knife-like pain returned with increased severity. There was increased abdominal rigidity and tenderness.

Abdominal laparotomy was performed, and the preoperative diagnosis was progressing acute cholecystitis. At operation an infarcted portion of the greater omentum was found attached by membranous adhesions to the anterior abdominal wall in the right upper quadrant. Herniation of the distal free edge of the omentum through a central omental defect had caused the infarction. (Fig. 1.) The gallbladder was normal. The damaged omentum was resected, and the patient had an uneventful recovery.

CASE II. R. S., a twenty year old college student was well until five days prior to admission when he

experienced the insidious onset of aching, mid-abdominal pain. This pain did not radiate. Soon afterward the patient had two loose stools of normal color. The patient had no fever, chills, gastrointestinal or urinary symptoms. Two days before admission the pain shifted to the right lower quadrant of the abdomen and persisted with varying intensity. Diarrhea did not occur again. The patient was able to continue all activities in spite of his discomfort.

Physical examination revealed a moderately ill man with a temperature of 100.2°F. and a pulse of 92. Positive physical findings were limited to the abdomen where there was localized and rebound tenderness in the right lower quadrant. Bowel sounds were normal. Rectal examination revealed tenderness on the right side but no palpable mass.

Leukocyte count on admission was 13,400 per cu. mm. with a normal differential. Urinalysis showed 9 to 15 white blood cells per high powered field. A diagnosis of acute appendicitis was made. At operation the appendix was found to be normal. A mass of dusky infarcted omentum was found firmly attached to the edge of the bladder and the anterior abdominal wall in the right lower quadrant. This mass was found to be peripheral omentum that had herniated through an omental defect with resultant infarction. The segment of omentum was excised and the defect closed. The patient's postoperative course was uneventful.

COMMENTS

Internal herniation is the precipitating factor in fewer than 1 per cent of cases of acute intestinal obstruction. These cases represent herniation of the small intestine through defects or weakened areas of parietal peritoneal attachment. Weak areas of attachment most commonly occur at the point of reflection of the peritoneum over the abdominal parietes. The most common site is the paraduodenal reflections where herniation can occur either to the right or left [3]. These hernias are often most difficult to treat because of the essential vascular structures that form part of the neck of the hernia.

Second in frequency are hernias through the ileocolic peritoneal reflections. Hernias also may occur through weak areas of the mesentery of the ascending and descending colon and through the pelvic floor, either anterior or posterior to the bladder. The broad ligament in the female, the foramen of Winslow into the lesser peritoneal sac, and defects in the greater omentum are other sites for internal hernia.

Herniation may also occur through peritoneal defects created by previous surgery. The most common site is the opening in the transverse mesocolon following posterior gastroenterostomy.

The two cases reported here are classified as hernias since a defect was present although no hernia sac was produced. The cause for the omental defects is not known. It has been postulated that abdominal trauma may produce these defects or that previous inflammatory disorders of the omentum may produce weak areas that subsequently tear. It also has been suggested that congenital omental defects may occur. In the light of evidence so far presented, none of these approaches has been convincingly substantiated.

Internal hernias are diagnostic problems. In most instances symptoms are those of small bowel obstruction. Often a short closed loop obstruction may be produced. This diagnosis should be suspected in those patients who manifest intermittent obstruction of the small bowel when there has been no previous surgery. In the cases illustrated symptoms were merely those of localized inflammatory disease at the site of the infarcted omentum. Atypical patterns of pain and symptomatology were evident in both cases although these were signs of localized inflammatory disease.

The atypical signs and symptoms may delay surgical treatment. If intestine is involved in the process, delay may lead to vascular compromise with subsequent necrosis and peritonitis. The signs of progression of the disease may be masked until this occurs. If this process is suspected, early surgical intervention is indicated.

SUMMARY

Two unusual cases of transepiploic omental hernia are presented. Unlike most internal hernias, small bowel was not involved. Symptoms in both cases were atypical, and preoperative diagnosis was that of other intra-abdominal disease. The pathogenesis of internal hernias and some problems of treatment are discussed.

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Excision of Congenital Hepatic Cyst of Bile Duct Origin

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WHILE congenital hepatic cyst has long been known as a pathologic entity, such cysts have not usually been detected clinically nor treated by surgical extirpation. Few follow-up reports after surgical excision have been recorded. We have, therefore, been prompted to describe a case recently treated and to review the pertinent literature.

CASE REPORT

The patient, a sixty-five year old white woman who had been experiencing intermittent epigastric pain during the past year, was referred for treatment of an abdominal aortic aneurysm. The pain was made worse by eating and it radiated directly through to the midback. The patient had suffered no loss of weight nor systemic symptoms. Physical examination revealed an obese lady with a blood pressure of 150/100 mm. Hg. The significant findings were limited to the abdomen. There was an obvious aneurysm of moderate size of the aorta. In addition there was deep epigastric tenderness and a sense of fullness in the right upper quadrant of the abdomen although a definite mass could not be delineated here. Roentgenograms confirmed the presence in the right upper part of the abdomen of a large lesion which displaced the gallbladder to the left and the transverse colon inferiorly. (Fig. 1.) An intravenous urogram demonstrated the likelihood of the lesion being separate and apart from the right kidney. (Fig. 2.) A calcified abdominal aortic aneurysm was seen also.

The patient underwent surgery on February 19, 1959. A large multiloculated cyst projecting from the right lobe of the liver was encountered. (Fig. 3.) It measured approximately 18 cm. in its greatest diameter and contained about 1,500 cc. of a thin, straw-colored fluid. After the fluid had been removed by aspiration, the cyst was excised. Its medial portion lay in close proximity to the gallbladder and more deeply it was adjacent to the structures in the porta hepatis. It was removed *en masse* except for a fraction of its superior lining which was firmly adherent to the undersurface of

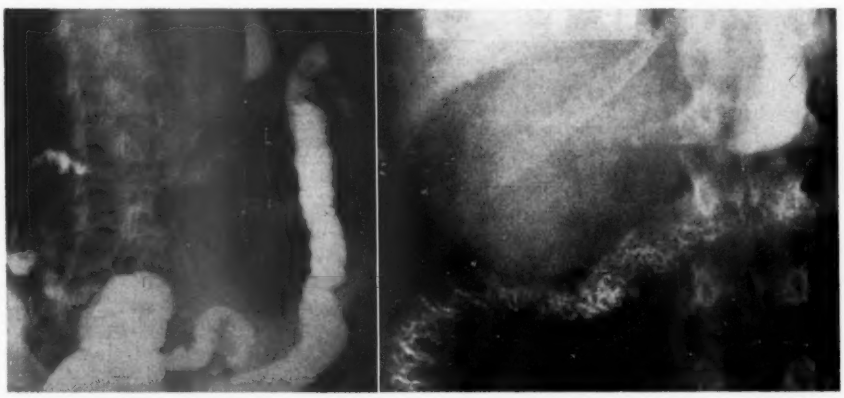

FIG. 1. Photographs of cholecystography and barium enema x-ray studies. The cyst in the right upper quadrant displaces the transverse colon inferiorly and the gallbladder to the left. The calcified aortic aneurysm can be seen.

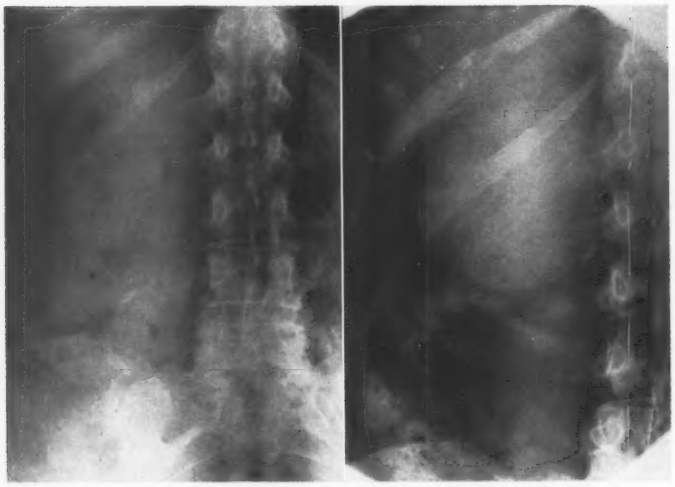

FIG. 2. Photograph of excretory urographic x-ray study. The hepatic cyst shadow is superimposed on the excretory urogram of the right kidney. Calcification of the cyst is present in its inferior-medial portion.

the small right lobe of the liver. Vessels along the circumference of the cyst were transfixed with silk ligatures. Two aortic aneurysms below the renal arteries were excised and a straight dacron stretch weave graft was interpolated. A thromboendarterectomy of the left common femoral artery was carried out. It was nearly totally obstructed by calcific intimal thickening. The appendix contained fecaliths and it was removed.

Pathologic study revealed the cyst wall to consist of hyalinized fibrous tissue with an inner lining of cuboidal epithelial cells. (Fig. 4.) Isolated bile ducts were present in the connective tissue, and in some sections compressed hepatic cells were seen adjacent to the cyst wall.

The postoperative course was uneventful. The patient returned one year later for a follow-up examination and was noted to be in good health. Abdominal examination revealed no evidence of recurrence of the cyst and the upper gastrointestinal series was entirely normal.

COMMENTS

Although there had been prior attempts to treat hepatic cysts surgically, Keen was one of the first to excise this lesion successfully in 1892 [3]. His patient lived. The mortality in the surgical therapy of nonparasitic cysts of the liver was at first almost prohibitive however and, of the sixty-one cases reviewed by Jones in 1923, many of the patients died of sepsis [2]. Simple drainage of the cyst was commonly performed in these early cases. At present there are approximately 200 cases of solitary cyst of the liver recorded in the literature, and excision of the cyst has been performed with increasing frequency [*1,2,4,7–14*]. Other procedures which have been reported include marsupialization of the cyst [*7,11*], drainage of the cyst with injection of formalin [*11*], and a cyst-gastric anastomosis [*4*]. There are few follow-up reports for each procedure, but there are instances mentioned in which marsupialization and simple drainage have been followed by recurrence of the cyst [*10,11*]. This may be a reflection of the difficulty attendant upon draining a cyst which is multiloculated and lined by cells which may continue to secrete fluid. For this reason it would appear that ablation of the cyst by excision affords the best chance for success.

Women show a preponderant incidence of congenital hepatic cyst. The cysts usually produce no symptoms although a rare complication is rupture. In the present case the aortic aneurysm rather than the hepatic cyst may have caused abdominal pain radiating to the back.

Although hepatic cysts may be associated with polycystic disease of the kidneys, more often the liver cyst is solitary and unassociated with renal disturbance. Our patient had no abnormality of the kidneys. Calcification, frequently seen in parasitic cysts of the liver, may

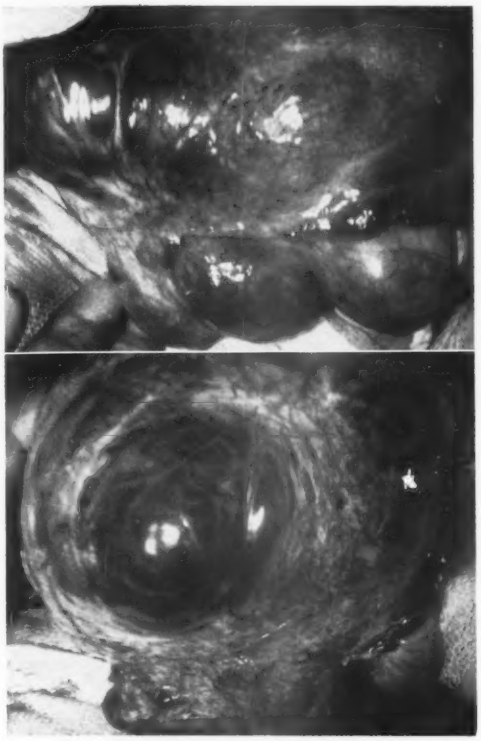

FIG. 3. Photograph of cyst made at the time of operation. The huge multiloculated cyst of the liver is seen to project from the inferior surface of the liver. The small remaining portion of the right hepatic lobe is adjacent to the cyst in the upper photograph.

also occur in the wall of a congenital cyst and be evident on x-ray films as well as on gross pathologic examination. In our patient calcium was present in the cyst.

The cause of congenital hepatic cyst has been clearly elucidated by tissue studies which have shown aberrant bile ducts in Glisson's capsule in a fetus and two infants [6,7]. This maldevelopment may proceed to cystic change, a process similar to cyst formation in other aberrant ducts in human beings, such as in the thyroglossal duct or in Gartner's duct. There is, therefore, little likelihood that nonparasitic solitary hepatic cysts are related to infection or to neoplasia as was once supposed. More accurate diagnostic methods and safer operative technics in surgery of the liver may bring congenital hepatic cyst to the surgeon's attention more frequently in the future than it has

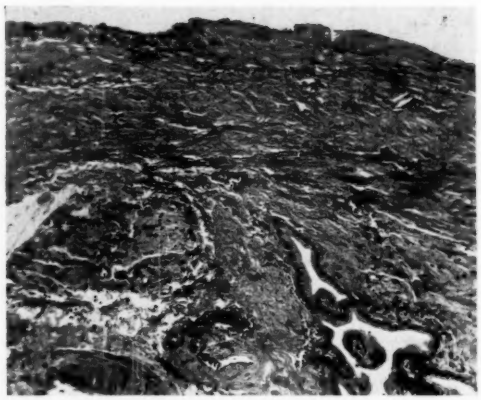

FIG. 4. Photomicrograph of cyst wall. The lining of the cyst is composed of low cuboidal epithelium and aberrant bile ducts are scattered throughout the cyst wall.

in the past. Indeed it is our impression that this clinical entity is being treated surgically and being reported more frequently in the literature in the last two decades than was the case in the first few decades of this century.

SUMMARY

A case of hepatic cyst and abdominal aortic aneurysm is presented and the pertinent literature relating to congenital cyst of the liver is reviewed. Our patient had no complaints and there was no evidence of recurrence when she was examined one year after surgical excision. Although follow-up reports of surgically treated individuals are rare, it would appear that excision of the cyst has been the most successful procedure. Simple drainage or marsupialization may lead to infection as well as recurrence of the cyst.

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Associated Carcinomas of the Larynx and Lung

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IN 1869 Theodor Billroth reported the first case of multiple primary cancer [1]. Following this report, a large number of similar cases were recorded [2,3]. It became apparent that the greatest percentage of multiple primary malignancies occurred in the same organ or in organs of the same system [4,5]. Although attention has been directed to the occurrence of multiple malignant tumors of the skin and of the gastrointestinal and genitourinary tracts, less emphasis has been placed on those in the lower respiratory tract. In each of the following six case reports, carcinoma of the larynx and lung were associated.

CASE REPORTS

CASE I. A fifty-seven year old man was admitted to the hospital because of a cervical mass. Two months before he had become aware of a tender mass in the left side of his neck. Following the discovery of the mass he experienced pain in the left shoulder and ear, increased cough and intermittent wheezing. He had smoked a package of cigarettes per day for most of his life. On examination a 2 cm. mass was palpated inferior to the left angle of the mandible. Expiratory wheezes were heard over the left lung.

During direct laryngoscopy biopsy of a tumor of the epiglottis was performed. Since carcinoma was found and a suspicious cervical node palpated, total laryngectomy and left radical neck dissection were performed. The extrinsic larynx and four cervical lymph nodes contained epidermoid carcinoma. Carcinoma *in situ* was noted adjacent to the laryngeal carcinoma.

Although no abnormalities were noted in the admission roentgenogram of the chest, the interpretation of one taken postoperatively was atelectasis of the left upper lobe. Therefore, bronchoscopy was performed. A tumor in the bronchus of the left upper lobe was visualized and biopsy was performed. The specimen contained epidermoid carcinoma. One month after laryngectomy and radical neck dissection left pneumonectomy was accomplished. The tumor, which appeared to have its origin in the left upper lobe bronchus, apparently had not spread to the twenty-four hilar lymph nodes submitted to examination. Carcinoma *in situ* was adjacent to the bronchial carcinoma.

Two years later a biopsy by aspiration of an enlarged right cervical lymph node and a biopsy of the hypopharynx were performed. Both specimens contained epidermoid carcinoma and were considered recurrences of the laryngeal carcinoma. No evidence of recurrence or metastasis was noted in serial roentgenograms of the chest. Palliative radiotherapy was administered and the patient is presently doing satisfactorily.

CASE II. A fifty-nine year old man was admitted to the hospital because of hoarseness. Two weeks previously he experienced pain on swallowing and persistent hoarseness. He had smoked a package of cigarettes per day for twenty years. On examination, a 1 cm. mass was palpated in the left anterior cervical triangle. Roentgenogram of the chest was unremarkable.

During direct laryngoscopy biopsy of a tumor at the base of the epiglottis was performed. Because epidermoid carcinoma was found and because of the palpable cervical lymph node, total laryngectomy and left radical neck dissection were performed. One lymph node contained carcinoma. Carcinoma *in situ* was noted adjacent to the laryngeal tumor. Following operation he intermittently coughed up blood. Hypertrophic tissue about the tracheostomy stoma was submitted for biopsy on two occasions. Granulation tissue and leukoplakia were the respective findings.

Eighteen months after laryngectomy and radical neck dissection hemoptysis increased. The interpretation of a follow-up roentgenogram of the chest was prominent right hilum and perihilar infiltration. He was readmitted for evaluation. At bronchoscopy a tumor in the bronchus of the right lower lobe was submitted for biopsy. Since the tumor was

an epidermoid carcinoma, a right thoracotomy was performed. Invasion of the wall of the chest and advanced mediastinal extension of the carcinoma were considered contraindications to resection. During the postoperative period intravenous nitrogen mustard was administered. Eleven months after diagnosis of bronchogenic carcinoma the patient died at another institution. No autopsy was performed.

CASE III. A seventy-three year old man was admitted to the hospital because of hemoptysis. Six years previously a hemilaryngectomy had been performed for epidermoid carcinoma of the intrinsic larynx. He had smoked two packages of cigarettes per day for forty-two years. Five and one-half years after the operation he began to cough up blood intermittently. Therefore, laryngoscopy and bronchoscopy had been performed. There was no evidence of recurrent carcinoma in the larynx, but the right lower lobe bronchus was stenosed and contained blood. Interpretation of bronchial biopsy was acute and chronic inflammation. Hemoptysis had persisted. Although previous serial roentgenograms of the chest had been unremarkable, one taken two months after the above endoscopy revealed an abnormal density in the right lower lobe region. Therefore, bronchoscopy was again recommended.

Bronchoscopy and biopsy of the right lower lobe bronchus were performed. At this time a tumor was visible and found to be an epidermoid carcinoma in the bronchial wall of the right lower lobe. He refused further surgical treatment and was discharged. Seven years after the hemilaryngectomy and six months after diagnosis of bronchogenic carcinoma he died in another hospital. No autopsy was performed.

CASE IV. A seventy-one year old man was admitted to the hospital because of recurrent carcinoma of the larynx. Four years previously radiotherapy had been administered for epidermoid carcinoma of the left vocal cord. Six weeks prior to admission biopsy of the left vocal cord and excisional biopsy of a small tumor of the anterior floor of the mouth were performed. Both specimens contained epidermoid carcinoma. He had smoked a package of cigarettes per day for forty years.

Following admission total laryngectomy and further excision of the oral lesion were performed. Recurrent epidermoid carcinoma of the intrinsic larynx was associated with adjacent *in situ* carcinoma. There was no residual carcinoma in the oral specimen.

Eight months after laryngectomy he noted hemoptysis and was treated for tracheitis sicca. Six years following laryngectomy a radiopaque mass was observed in the left upper lobe region. Initially he declined investigation of the pulmonary abnormality. However, because of anterior chest pain he entered The George Washington Surgical Division of The District of Columbia General Hospital eighteen months later. The radiopacity had enlarged remarkably. Bronchoscopy and left scalene node biopsy were nondiagnostic. At left thoracotomy an epidermoid carcinoma of the left upper lobe was considered nonresectable due to invasion of the wall of the chest and mediastinum. Death occurred three months later. No autopsy was performed.

CASE V. A fifty-nine year old man was admitted to the hospital because of laryngeal carcinoma. Nine months previously radiotherapy had been administered to the right side of his neck for proved epidermoid carcinoma in a cervical lymph node. Attempts to detect a primary tumor had been unsuccessful. Because of a recurrent cervical mass and pain on swallowing he consulted The George Washington University Cancer Clinic. A 4 cm. mass was noted beneath a healed surgical scar in the right anterior cervical triangle. Roentgenogram of his chest was considered to be unremarkable. Laryngeal biopsy proved the presence of epidermoid carcinoma in the extrinsic larynx. He was admitted to The George Washington University Hospital for total laryngectomy and right radical neck dissection. Three cervical lymph nodes contained metastatic tumor. Carcinoma *in situ* was noted adjacent to the primary tumor.

Four months later he experienced increased cough and hemoptysis. Three months after onset of hemoptysis interpretation of a chest roentgenogram was dense infiltration of the left lower lobe. He was admitted to another hospital. Biopsy of a tumor in the bronchial wall of the left lower lobe revealed anaplastic epidermoid carcinoma. At thoracotomy the tumor was considered nonresectable because of marked mediastinal invasion.

Palliative chemotherapy was administered following discharge. However, he gradually deteriorated and died three years after diagnosis of laryngeal carcinoma and fourteen months after diagnosis of bronchogenic carcinoma.

CASE VI. A fifty-four year old man was readmitted to the hospital because of a mass in the neck. Five months previously total laryngectomy had been performed at The George Washington University Hospital for epidermoid carcinoma of the extrinsic larynx. One prethyroid lymph node contained metastatic tumor and carcinoma *in situ* was noted in the margin of the specimen. Interpretation of a chest roentgenogram had been atelectasis of the posterior segment of the right upper lobe.

Two weeks before the second admission he noted a mass in the neck and increased productive cough.

He had smoked three to four packages of cigarettes per day for most of his life.

On examination respirations were thirty per minute and temperature was 39°c. A 3 cm. mass was noted adjacent to the tracheal stoma. Interpretation of thoracic roentgenogram was abscess of the right upper lobe.

Biopsy of the neck mass was performed and metastatic epidermoid carcinoma was found in the specimen. In addition to other therapeutic measures for abscess of the lung, three bronchoscopic procedures were performed. Biopsy of a stenosed orifice to the right upper lobe revealed squamous metaplasia in the bronchial mucosa.

Because of the patient's rapid deterioration exploratory thoracotomy was elected. Necrotic tumor in the right upper lobe invaded the wall of the chest and mediastinum. Because the necrotic mass and main bronchus of the right upper lobe were entered during exploration, palliative pneumonectomy was manditory. Tumor had invaded above the carina and bronchial closure could not be accomplished in tissue free of carcinoma. Following a period of shock and tachypnea he expired fourteen hours after pneumonectomy. The epidermoid carcinoma of the lung was considered to have arisen in the bronchus of the right upper lobe.

COMMENTS

Numerous recent reports have demonstrated premalignant changes in the lower respiratory tract. Basal cell hyperplasia, stratification, squamous metaplasia and carcinoma *in situ* have been found frequently in respiratory mucosa adjacent or distant to carcinoma of the larynx or lung [*6–21*].

Premalignant changes have also been noted in the respiratory mucosa of heavy smokers [*22–26*]. A statistical relationship between the incidence of bronchogenic carcinoma and laryngeal carcinoma and smoking has been established [*27–30*]. Increased use of tobacco and increased incidence of cancer in the respiratory tract has been in rough proportion [*28,31*]. Since the larynx and bronchial tree form a common channel lined by similar epithelium which may be stimulated at any point by inhaled carcinogens, since premalignant changes have been noted in both sites and since the incidence of invasive carcinoma in both the larynx and lung appears to be increasing [*29,32*], it is not surprising to find the occurrence of synchronous or metachronous carcinoma of the larynx and lung. In view of this evidence, it is strange that more cases of associated laryngeal and bronchial carcinoma are not reported [*29, 33–38*]. For instance Cahan, Butler, Watson and Pool reviewed 1,493 cases of bronchogenic carcinoma and found four with synchronous laryngeal carcinoma [*39*]. Frazell and Gerold reported six cases of associated bronchogenic carcinoma among 683 patients known to have laryngeal carcinoma [*40*]. There may be several reasons for the rather low reported incidence of associated carcinoma of the larynx and lung: (1) Since the cell type of associated carcinoma of the larynx and lung is most frequently epidermoid, the two lesions often cannot be distinguished by histologic examination. This fact may have tempered enthusiasm to report patients with cancer in both sites. In spite of histologic similarity, Lewis and Schaff have presented several sound reasons for the separate and independent origin of associated carcinoma of the larynx and lung [*36*]. (2) In the event diagnosis of laryngeal carcinoma is established, an associated bronchogenic carcinoma may be regarded during life or at necropsy as a pulmonary metastasis. Carcinoma of the larynx does not metastasize frequently to the lung at any stage. In an analysis of 240 cases of terminal laryngeal carcinoma Latella found pulmonary metastasis in only 6 per cent [*41*]. (3) Associated carcinoma of the larynx or lung may have been unrecognized at necropsy. Routine microscopic examination of apparently normal larynx and bronchi is not part of necropsy protocol. A number of unsuspected invasive bronchogenic carcinomas have been detected in this way [*42–47*].

DIAGNOSIS OF ASSOCIATED CARCINOMA OF THE LARYNX OR LUNG

When the diagnosis of laryngeal carcinoma is established, the possibility of an associated bronchogenic carcinoma deserves consideration. The presence of laryngeal carcinoma should not confuse the significance of symptoms such as wheezing, hemoptysis and increased cough. An abnormal opacity in a roentgenogram of the chest may not represent malignant laryngeal metastasis. Bronchoscopy may reveal associated and unsuspected bronchogenic carcinoma.

Following laryngectomy, hemoptysis and increased cough may not be due to tracheitis sicca, tracheobronchitis or trauma from the laryngectomy tube. The explanation for these symptoms in Cases II, III and V was bronchogenic carcinoma. Serial roentgenograms of the

chest are part of usual follow-up. If either the symptoms or roentgenogram suggest primary associated lung cancer, bronchoscopy should be considered.

When the diagnosis of bronchogenic carcinoma is suspected, the possibility of associated laryngeal carcinoma merits consideration. Hoarseness, dysphagia, and cervical adenopathy may not be contraindications to thoracotomy for bronchogenic carcinoma but may be indications of associated carcinoma of the larynx. During bronchoscopy visualization of the larynx is often unsatisfactory particularly if local anesthesia is used. Direct laryngoscopy preliminary to bronchoscopy for suspected lung cancer may yield an occasional unsuspected laryngeal carcinoma. At laryngoscopy apparent vocal cord paralysis may actually be due to cord fixation from underlying intrinsic carcinoma of the larynx. Biospy of the quiet cord might differentiate.

Following pulmonary resection for bronchogenic carcinoma, onset of hoarseness, dysphagia and cervical adenopathy may not be evidence of hopeless recurrence. Laryngoscopy may reveal associated treatable carcinoma of the larynx as the cause of these symptoms and signs.

TREATMENT OF ASSOCIATED CARCINOMA OF THE LARYNX OR LUNG

In the event operable carcinomas of the larynx and lung are diagnosed simultaneously, Cahan has suggested the pulmonary lesion be operated first since it is potentially more lethal and may be nonresectable [33]. However, Case 1 is an example of the performance of laryngectomy prior to pneumonectomy. No difficulty was encountered. Laryngeal carcinoma simultaneous with nonresectable bronchogenic carcinoma is probably best treated by radiotherapy. Tracheostomy prior to thoracotomy is wise, because postoperative laryngeal edema, fragmentation and aspiration of infected laryngeal tumor and unsatisfactory postoperative tracheobronchial toilet may be avoided. If total laryngectomy is anticipated, tracheostomy should be performed at a higher level than usual in order to facilitate construction of the permanent tracheostomy. Following satisfactory recovery from thoracotomy treatment of the laryngeal carcinoma may be carried out.

Should bronchogenic carcinoma develop subsequent to treatment of laryngeal carcinoma, usual therapeutic measures for carcinoma of the lung would be in order. The same would apply to treatment of carcinoma of the larynx were it to become evident following apparently curative resection of bronchogenic carcinoma.

SUMMARY

Six cases of associated laryngeal and bronchogenic carcinoma are presented. Diagnosis of laryngeal carcinoma uniformly preceded recognition of bronchogenic carcinoma. Early symptoms of bronchogenic carcinoma were confused by the presence of laryngeal carcinoma or by postlaryngectomy status.

The possibility of bronchogenic carcinoma in association with known laryngeal carcinoma deserves consideration particularly if symptoms or roentgenograms of the chest suggest bronchogenic carcinoma. Laryngeal carcinoma in association with suspected or established bronchogenic carcinoma also merits consideration. Aggressive treatment of both associated tumors is suggested.

The exact incidence of associated laryngeal and bronchogenic carcinoma is unknown. In view of increasing evidence for the multiple origin of malignant tumors in the respiratory tract and increasing frequency of carcinoma of the larynx and lung, the incidence and potential curability of these associated malignancies may be higher than recognized previously.

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Eosinophilic Granuloma of the Stomach

DIAGNOSIS AND SURGICAL THERAPY

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MOST REPORTED cases of gastric infiltrative lesions in which eosinophilic leukocytes are prominent have sufficient clinical features in common to justify the assumption of a syndrome called "eosinophilic granuloma." This is now readily diagnosed clinically rather than from the pathologic specimen, as in the past instances which have been recorded [1–14].

Kaijser [1], in 1937, reported a case of a fifty-three year old man, with a family history of allergy, who complained of epigastric pain and vomiting. This patient had a vague history of gastrointestinal sensitivity to onions. He was subjected to subtotal gastrectomy for the presumed diagnosis of peptic ulcer. The resected specimen grossly showed edema of the mucosa and submucosa of the distal part of the stomach. Microscopically, there was cellular infiltration of these parts of the stomach, with eosinophiles and plasma cells in abundance. An eosinophilia of 26 per cent was noted nine days postoperatively. Also reported in this same paper are two cases of small intestinal eosinophilic infiltrations. Resection was performed and the patients were presumably cured. These lesions were attributed to neoarsphenamine sensitivity.

Recently, McCune, Gusack and Newman [2] reported three cases of upper gastrointestinal eosinophilic infiltrations and reviewed the literature on the subject. These authors distinguished two types of lesions which they termed "eosinophilic gastroduodenitis" and "eosinophilic granuloma." The former term was applied to patients with diffuse gastric or upper gastrointestinal infiltrative lesions and the latter to patients with localized eosinophilic lesions of the pylorus or prepylorus. Both groups showed similarity in the basic pathologic process and in their association with a history of previous or concomitant allergic disorders, and a frequency of blood eosinophilia. The patients reviewed by these authors and others [3–5] often revealed association with eosinophilia of peripheral blood (in one case 62 per cent [6]) and personal and/or familial history of some allergic manifestation, most commonly hay fever or asthma.

Previously reported cases of gastric eosinophilic infiltrations have occurred more frequently in men than in women, and from the third to the sixth decades. Symptoms most commonly observed were epigastric distress, vomiting of varying severity and diarrhea [7]. The basic pathologic physiology underlying the symptoms appeared to be some degree of pyloric obstruction. Gastrointestinal hemorrhage was the presenting symptom in several cases. Judd, Civin and McIlhany [7] reported a patient who entered the hospital with a hemoglobin level of 7.5 gm. per cent.

Gastrointestinal series have been reported to show pyloric or antral obstruction varying in degree from narrowing and temporary delay in passage of barium to marked retention of barium after eighteen hours [7]. One patient, reported by Booher and Grant [8], had a prepyloric filling defect which prolapsed into the pyloric canal.

Reports on gastric acidity are rare, but Doniach and McKeown [9] reported hypoacidity in their patient, and that of Judd, Civin and McIlhany had only five units of free acid. Nevertheless, the patient reported by Spencer, Comfort and Dahlin [6] had 32 units (Töpfer's test) of free acid after histamine. Eosinophilia has been lacking in some cases.

In the few cases in which gastroscopy has been performed, the involved mucosa has been described as "mammillated [9]" or "cobblestone

[*10*]." Operative findings are generally reported as some form of pyloric edema or infiltration, with greater or lesser degrees of tumefaction. In some cases the infiltration has been extensive and has been taken for carcinoma [*7,9,11,13*]. The surgical treatment of patients reviewed has varied from biopsy only [*10*] to posterior gastroenterostomy [*12*] to radical subtotal gastrectomy [*7*].

Vanek [*14*] collected six cases of gastric antral eosinophilic infiltration. In none of the patients was either an allergic history or a blood eosinophilia found.

CASE REPORT

A twenty-six year old male investment banker (No. 362 344) was admitted to The New York Hospital-Cornell Medical Center on October 1, 1955, complaining of intermittent vomiting. He had always been underweight, and he attributed this fact to a "low food capacity," manifested by remaining "full" for many hours after eating, and frequently by vomiting food eaten many hours previously. Eggs and wheat-containing foods precipitated this chain of events. In the preceding six months, his symptoms had increased in severity and he had lost 2.5 kg. in weight. He had suffered from recurrent bronchial asthma since childhood, and hay fever and urticaria in recent years. Three years before, he had developed unexplained diarrhea and was noted to have blood eosinophilia which was on several occasions as high as 32 per cent on the peripheral smear. Both parents and one sibling had suffered from various allergic disorders, and his mother was once told that she had a "polyp of the stomach." Physical examination was unremarkable except for his asthenic habitus, 145 pounds (64 kg.) with a height of 6 feet 3 inches (188 cm.). There was slight tenderness deep in the epigastrium.

The results of urinalysis were normal, red blood cell count was 6.5 million per cu. mm., hemoglobin was 15.8 gm. per cent (Sahli's test), white blood cell count was 14.5 thousand per cu. mm. with 23 per cent eosinophiles on the peripheral smear. Three circulating eosinophile counts were 316, 559, and 890 per cu. mm., respectively. Gastric analysis revealed absence of free acid following histamine stimulation. Cytologic study of abrasive gastric washings showed no malignant cells. Chest x-ray and skeletal survey roentgenograms, proctoscopy and a barium enema showed normal findings. The radiologist reported the gastrointestinal x-ray films as showing "a filling defect of the greater curvature and persistent annular narrowing of the pylorus and prepylorus with rigidity and appearance of shelf formation proximal to the narrowed segment. There is no evidence of gastric ulceration." (Fig. 1.) The differential diagnosis suggested by the radiologist was the following: (1) gastric lymphosarcoma, (2) carcinoma of stomach, (3) antral gastritis and (4) aberrant pancreas.

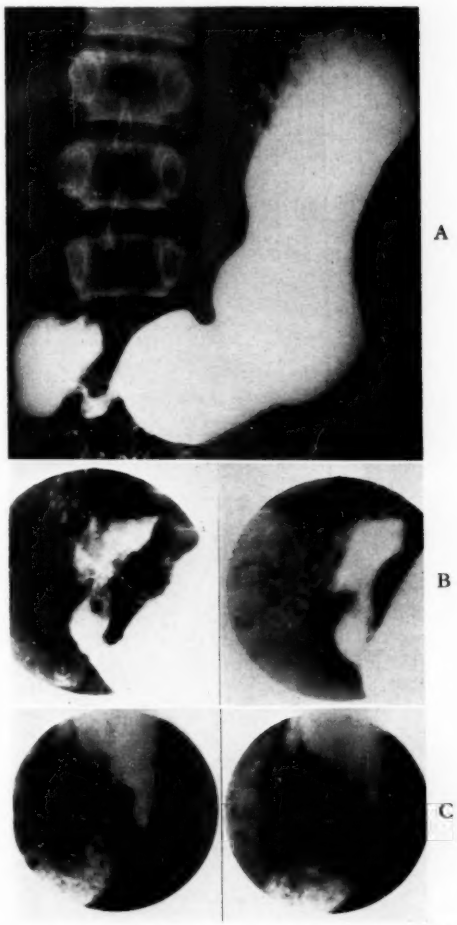
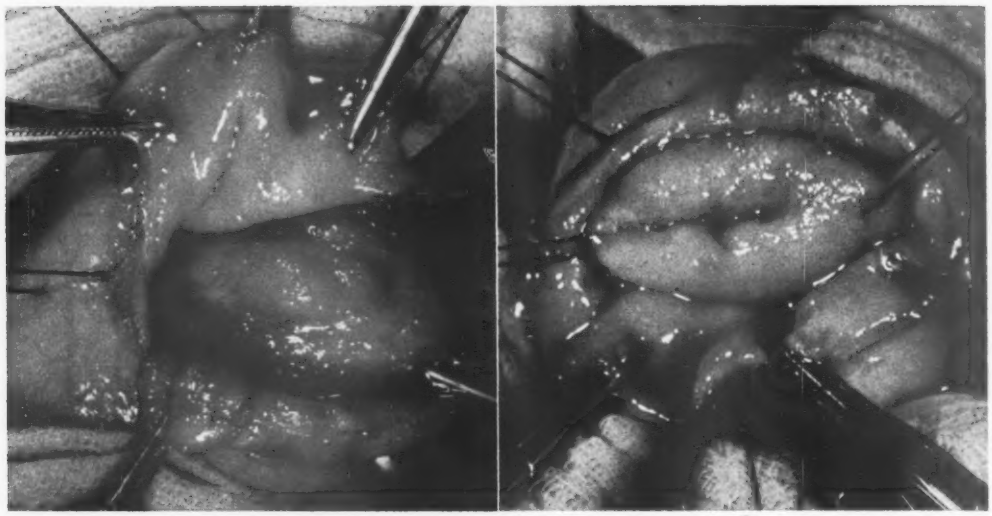


FIG. 1. A, over-all view of the stomach, showing pyloric narrowing. B, spot films of the sparsely filled pyloric area, showing the rigidity and filling defects. C, spot films of the sparsely filled greater curvature area, showing the filling defect mentioned in the radiographic report.

Gastroscopy revealed a reddened, granular, hemorrhagic antral mucosa which the examiner felt was probably inflammatory in origin. Cutaneous allergic sensitivity tests suggested moderate to marked sensitivity to various cereals and several other common dietary items. Because of the definite positive history of egg sensitivity, cutaneous tests for this atopy were omitted.

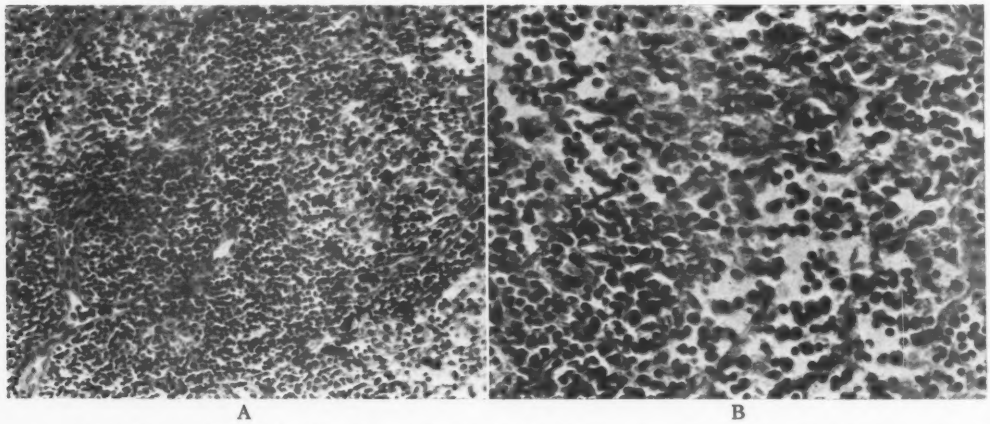
In the light of these findings, it was the opinion



A B

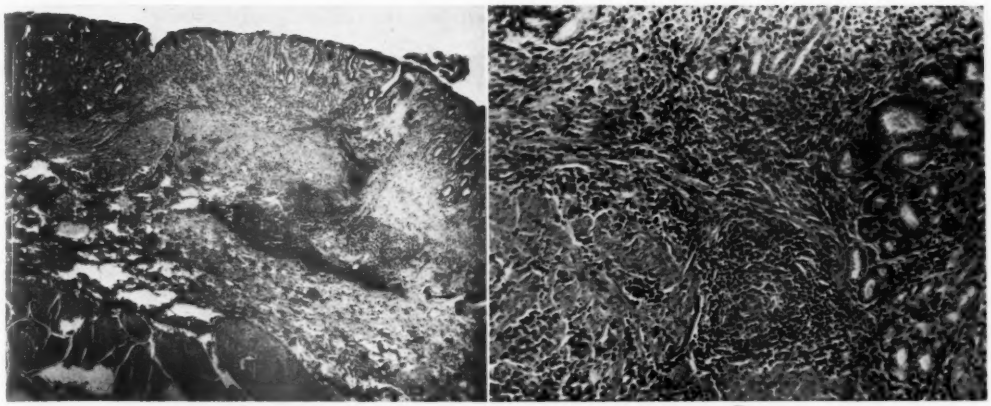
FIG. 2. Gross appearance of the submucosal nodule (A) and the narrowed, granular pyloric canal (B). The "mosquito clamps" and the No. 3–0 silk sutures aid in evaluating the relative size of the lesions.

of one of us that this represented a case of eosinophilic gastritis, and that operation was indicated in order to rule out the possibility of malignancy and to relieve the partial pyloric obstruction. At operation, the pylorus was found to be thickened and obviously infiltrated by some inflammatory-appearing process. The mesogastric lymph nodes were slightly enlarged and succulent. The filling defect seen on the greater curvature radiographic spot films was not palpable, so gastrotomy was performed to facilitate direct inspection of the gastric mucosa. The cause of the filling defect was seen to be a submucosal nodule, 0.5 by 1 cm. Frozen section revealed it to be filled with eosinophiles, and it was the opinion of the surgical pathologist that the lesion was an eosinophilic granuloma. The pyloric canal was stenosed and would not admit the tip of the fifth finger. An anterior gastrojejunostomy was performed. The final pathologic report indicated eosinophilic gas-



A B

FIG. 3. Photomicrographs showing the submucosal lymphoid nodule heavily infiltrated by eosinophiles. A, magnification of 220. B, magnification of 440.



A B

FIG. 4. Photomicrographs of the pylorus infiltrated by inflammatory cells, mostly eosinophiles. A, magnification of 33. B, magnification of 150.

troduodenitis. Figure 2 illustrates the gross appearance of the gastric lesions and Figures 3 and 4 demonstrate their microscopic appearance.

The patient recovered from the operation and the postoperative gastrointestinal x-ray films showed the gastroenterostomy to be functioning, with the pylorus still markedly stenosed.

The patient had relief from vomiting, and regained 2.5 kg. He returned to his normal activities and adhered to his allergen-free diet fairly well. Some months later he swallowed a chicken bone that became lodged in his esophagus and had to be removed esophagoscopically. Biopsy of a narrowed area where the bone had lodged failed to reveal evidence of excessive eosinophiles. His blood eosinophile count at this time, however, was 2,863 and 1,434 eosinophiles per cu. mm. The patient was again well until April 13, 1957, a year and a half after the gastroenterostomy, when he drank seven generous highballs. He slept late the following day, ate lunch, went back to sleep, awoke late in the afternoon, vomited bright red blood several times and was barely able to reach the telephone to call for help. He arrived at the hospital in shock, and 750 cc. of plasma and 1,000 cc. of whole blood were required to alleviate the shock. The bleeding ceased, and a gastrointestinal x-ray film taken several days later again revealed a normally functioning gastroenterostomy and a narrowed pylorus. No marginal ulcer or other gastrointestinal lesion could be demonstrated. Whether the bleeding occurred from a granuloma, an ulcer or from alcoholic gastritis could not be determined. A gastric analysis again showed absence of free acid secretion after histamine stimulation. Since this episode, the patient has again been well and has adhered more cautiously to his diet.

SUMMARY

Eosinophilic granuloma of the stomach may be diagnosed clinically. The number of patients reported is not large. We believe, however, that an alertness to the findings in patients with this condition will result in the disease being more frequently recognized. A brief review of the literature is presented and an additional patient reported with a four year follow-up.

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Lymphosarcoma of the Stomach

A LONG TERM FOLLOW-UP REPORT OF TWO CASES OF RETICULUM CELL SARCOMA

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SINCE 1871, when the first report of a case of primary lymphosarcoma of the stomach was made by Curveilhier [1] literature on the subject has steadily accumulated. In 1952, in an extensive review of the world literature, Snoddy [2] collected 508 case reports including his own. Recently, Frazer [3] reported thirty-one cases of malignant lymphomas of the gastrointestinal tract, of which eighteen were gastric. This represented the entire experience with such tumors at Duke Hospital from 1930 to 1952. Farmer [4] in 1957 reported seven cases of primary lymphosarcomas of the stomach at Touro Infirmary from 1942 to 1956. These represented 2.1 per cent of all gastric malignancies. The incidence of gastric lymphosarcoma is variously reported as being 0.3 per cent to 2.1 per cent of all gastric malignancies. Of the reported cases of gastric lymphosarcoma, reticulum cell sarcoma represents from 12 per cent, as reported by Berger et al. [5], 18.7 per cent by Marshall and Meissner [6] to 28.1 per cent as reported by Thorbjarnarson et al. [7].

PATHOLOGY

A wide variance exists in the classification of gastric lymphosarcoma, as well as in the prognostic implications of the various types. Predominant cell type determines the group into which each sarcoma falls, although many varying types may be found in any one tumor. Gall and Mallory [8] differentiated seven groups of lymphomas: (1) stem cell lymphoma, (2) clasmatocytic lymphoma, (3) lymphoblastic lymphoma, (4) lymphocytic lymphoma, (5) Hodgkin's lymphoma, (6) Hodgkin's sarcoma and (7) follicular lymphoma. Most pathologists tend to use a simpler classification which can be grouped as follows: (1) lymphosarcoma, which is subdivided into lymphoblastic or lymphocytic; (2) reticulum cell sarcoma; and (3) Hodgkin's subdivided into lymphoma and sarcoma.

Most gastric lymphomas are grossly not distinguishable from carcinomas, although mucosal involvement is found earlier in carcinomas. Thus, a bulky gastric lesion, covered by intact mucosa, should make one suspect the possibility of lymphoma. Spread may occur through the wall of the stomach and may cause perforation. Indurated ulceration may be found. Polypoid lesions may be seen. Diffuse infiltration of the stomach may produce an appearance similar to linitis plastica. Thickening of the submucosa frequently produces giant rugae.

According to Allen et al. [9] lesions are multicentric in origin in about 25 per cent of the patients. Distant metastases apparently occur quite late. Enlarged regional lymph nodes may be due to tumor metastases but, significantly, frequently are found to contain no tumor. In neither of the two patients reported in this article, were the regional nodes involved. Of the eighteen gastric lymphosarcomas reported by Frazer [3], positive nodes were found in fifteen, yet none showed evidence of distant metastases. Of the thirty-two lymphomas of the stomach reported by Thorbjarnarson [7], lymph nodes were involved in only thirteen. Of the seven patients reported by Farmer [4], only one had nodes involved at the time of surgery.

CLINICAL ASPECTS

Age, sex and symptoms are not characteristic of lymphosarcoma of the stomach, being essentially the same as seen in carcinoma. However, it is interesting that several authors have described a fairly long period of ulcer-like

symptoms prior to diagnosis. Ulcer-like pain was a predominant symptom in Case II. Weight loss, anorexia, anemia and either melena or hematemesis occur in most patients with sarcoma, as in those with carcinoma. A palpable mass is found fairly frequently, as in Case II, and is more apt to be seen in patients with sarcoma than in those with carcinoma of a comparable stage of development. Pyloric obstruction apparently is quite unusual. While most patients with gastric lymphosarcoma show anacidity in their gastric analyses, the presence of free hydrochloric acid does not militate as strongly against the diagnosis of sarcoma as of carcinoma.

Radiologic demonstration of tumor is the most important diagnostic procedure. While there are no specific characteristics of lymphosarcoma which can distinguish this disease from carcinoma of the stomach, certain findings may be suggestive [4]: (1) a filling defect with smooth margins, (2) a localized tumor with smooth or rounded margins, (3) a diffuse lesion suggesting linitis plastica, (4) thick mucosal folds, (5) a polypoid tumor in younger patients and (6) multiple ulcers or polypoid lesions. While none of these radiologic findings are characteristic in themselves, some of them are uncommon in carcinoma and combinations of more than one of these findings should raise the index of suspicion regarding lymphosarcoma.

CASE REPORTS

CASE I. M. S., a sixty year old white man, was admitted to the Albert Einstein Medical Center—Southern Division on May 13, 1952. He complained of pain in the left upper quadrant radiating to the back and left shoulder. Pain was of four months' duration and was relieved by ingestion of food, particularly milk. Five months prior to this admission, the patient had been operated on by the senior author and cholecystectomy and choledochostomy were performed for calculous cholecystitis and common duct stone. No gastric lesion could be seen at operation and it is of interest that an upper gastrointestinal x-ray film prior to operation revealed no gastric abnormality.

At the time of the second admission, the patient gave no history of nausea, vomiting or hematemesis. However, an upper gastrointestinal roentgenogram revealed an irregularity of the mucosa of the antrum of the stomach with complete loss of normal pattern; a change which had appeared during the four month interval between hospitalizations. During gastroscopy, coffee ground vomitus appeared for the first time. Gastric analysis showed the presence of free hydrochloric acid in the gastric content. A repeat roentgenographic examination of the stomach again revealed the same irregularities. Exploration on May 22, 1952, showed a huge ulcerating mass in the distal end of the stomach extending into the first part of the duodenum. The liver was grossly free of metastases. There were no obviously enlarged nodes. A radical subtotal gastrectomy, and omentectomy and posterior gastrojejunostomy were performed. The pathologic diagnosis was reticulum cell sarcoma of the stomach. The patient was discharged from the hospital on May 29, 1952. Postoperative roentgenotherapy to the upper abdomen was attempted but the patient developed severe nausea and vomiting and therapy was discontinued. To date, seven and one-half years after surgery, there has been no evidence of recurrence of the gastric lesion. The patient is in excellent health with no gastrointestinal complaints.

CASE II. R. G., a fifty-two year old white woman, was admitted to Albert Einstein Medical Center—Southern Division on May 7, 1956, with severe abdominal pain. The history revealed that four months prior to admission pain had developed in the epigastrium and left upper quadrant of the abdomen. Pain could be relieved by ingestion of any kind of food. Two weeks prior to admission the pain began to increase in intensity and frequency. The night before admission it became extremely severe and has remained constant since. No history of nausea, vomiting, hematemesis or tarry stool was given.

Physical examination revealed marked rigidity of the upper abdomen, especially in the epigastrium and left upper quadrant. The lower abdomen was soft. An exquisitely tender mass, 3 by 4 inches in diameter was palpable to the left of the epigastrium. Her temperature was 99.2°F.; blood pressure, 130/70 mm. Hg; pulse, 96 per minute and regular; and normal peristalsis was heard. Balance of the physical examination was essentially negative. Laboratory studies revealed a hemoglobin of 11.7 gm. per 100 ml. or 75 per cent; white blood cell count of 10,700 per cu. mm.; and a differential cell count of 73 per cent polymorphonuclears and 6 per cent nonsegmented leukocytes.

An x-ray film of the abdomen did not show free air under the diaphragm. No mass or calcification was seen on plain films of the abdomen. An emergency laparotomy was performed on the day of admission and exploration revealed a large ulcerating mass in the anterior wall of the stomach, involving the entire thickness of the wall and extending high along the greater curvature. A few large lymph nodes were present in the prepyloric region. No hepatic metastases were seen. An almost

total gastrectomy, and omentectomy and splenectomy were performed, followed by a retrocolic gastrojejunostomy. The pathologic study showed a large polypoid tumor, the surface of which was ulcerated, arising from the mucosal lining and infiltrating the entire thickness of the stomach wall. Microscopic examination proved the tumor to be of the reticulum cell sarcoma variety; sections of all lymph nodes showed only hyperplasia of the reticuloendothelial elements. Mild thrombophlebitis developed in the patient postoperatively, and responded promptly to treatment. She was discharged on June 18, 1956. No roentgenotherapy was administered and to the present time, three and one-half years postoperatively, there has been no evidence of recurrence of the disease.

TREATMENT AND PROGNOSIS

Radical resection as performed for carcinoma of the stomach, followed by intensive radiation treatment of the abdomen offers the best hope of prolonged arrest of the disease. An occasional case has been reported in which local conditions made resection impossible yet apparent complete arrest was obtained following radiation. Palliation for long periods of time may also be accomplished by radiation. A study of the behavior of gastric lymphoma indicates that a highly aggressive surgical attack is indicated in all cases of primary gastric lymphoma. This means that the surgeon, before deciding that an extensive gastric tumor is categorically nonresectable, should obtain diagnosis by frozen section from the tumor. If the report is lymphoma every attempt should be made to resect since startlingly long periods of arrest of the disease occur. No patient with a gastric lymphoma should be declared nonresectable because of extensive lymph node enlargement, since many reports indicate that the enlarged nodes seen in these patients often prove to be nonspecific lymphoid hyperplasia and not metastases [3,4,7]. Case II in this report is illustrative.

In general, the prognosis after resection (either with or without postoperative radiation) is better than in comparable series of carcinoma of the stomach. Of eighteen patients explored in Frazer's [3] series, nine resections were performed with hope of cure and two for palliation. Of the nine curative resections, seven lived more than five years and one died of recurrence after five years. In the series studied by Thorbjarnarson [7], 53 per cent of the patients surviving surgery were alive without demonstrable evidence of recurrence at the end of five years. In a recent report by McNeer and Berg [10] from Memorial Hospital the five year survival rate in primary gastric lymphoma was 35 per cent. The quoted figures, to which we add the two apparently arrested cases discussed in this report, are evidence of the value of bold surgical attack for these lesions.

The surgeon of good judgment, given a tissue diagnosis of gastric lymphoma, should not permit himself to be discouraged by those conditions that would spell defeat in the presence of a carcinoma; namely, extensiveness of the primary growth or widespread lymph node enlargement. The occasional amazing long term "cure" of patients after surgery for extremely extensive tumors should offer hope and encouragement to the surgeon who encounters a tumor of this type.

SUMMARY AND CONCLUSIONS

1. The literature on lymphosarcoma of the stomach has been reviewed and two cases reported with no evidence of recurrence after seven and one-half and three and one-half years.

2. There are no specific diagnostic criteria for this disease which differentiate it from carcinoma. However, certain points in the history and in the roentgenographic findings may lead one to suspect the true diagnosis.

3. It is vitally important to obtain a tissue diagnosis from the tumor at exploration, since a diagnosis of lymphoma should encourage the surgeon to be as aggressive as is compatible with safety. Grossly enlarged lymph nodes in the region of the tumor do not contraindicate extensive resection if the diagnosis of lymphoma has been established, since many studies and the cases reported herein indicate that often node enlargement is not due to tumor metastases.

4. If possible, resection should be followed by radiation treatment of the abdomen. If resection is not feasible radiation should be used after exploration, since long periods of palliation have been reported following radiation.

5. If resection can be accomplished, the prognosis for five year arrest is far better than that for carcinoma of the stomach.

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Postoperative Inflammatory Change in Retained Adnexae Uteri

REPORT OF TWO CASES

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RETAINED adnexae uteri, following hysterectomy, may undergo pathologic changes which necessitate subsequent excision [7]. Disease occurring in retained adnexae can be classified into two groups: Group A. Tubo-ovarian disease associated with a similar incidence in the general population and not resulting from the previous surgical operation. Group B. Tubo-ovarian disease which occurs, at least in part, as a result of the previous surgical operation.

It is generally believed that malignancy in the retained ovary does not have a higher incidence than in the general population [3,16]. Further, there is no evidence to indicate an increase in the frequency of benign neoplasm [3,4,10]. Despite theoretical grounds for supporting an increased incidence of functional cysts, resulting from vascular impairment at the time of surgery [2,23,24], recent series have not substantiated this contention completely [3,10]. These neoplasms and cysts are included in Group A.

Reported herein are two cases with complications that fall into Group B. Inflammatory changes developed in the tubes and ovaries, which were grossly recognized as normal at time of hysterectomy, within about three months postoperatively. Thus, a second surgical procedure was necessary.

CASE 1. E. H., a thirty-eight year old white woman (para 0-0-1-0), was admitted to The Long Island Jewish Hospital April 27, 1955, because of vaginal staining of four months' duration. Pelvic examination revealed a uterus of normal size, and curettage of the uterus showed polypoid endometrium with focal hyperplasia.

She was readmitted January 2, 1957, because of recurrent staining. Examination revealed a uterus completely retroverted and normal in size. At this time a slight increase in the anterior to posterior diameter of the uterus was noted and curettage showed proliferative endometrium. A third curettage was performed April 21, 1959, because of menorrhagia and dysmenorrhea as well as persistence of metrorrhagia, and for the first time a protuberant irregularity approximately 2 cm. in diameter was felt on the posterior wall of the uterus. A hysterogram substantiated the diagnosis of a submucous myoma. On September 17, 1959, a total abdominal hysterectomy was performed. Both tubes and ovaries appeared grossly normal and were permitted to remain. Examination of the excised uterus showed a large submucous myoma.

The patient's postoperative course was uneventful until the fourth day when her temperature rose to 102°F. On examination, the abdomen showed direct and rebound tenderness in both lower quadrants. Chloramphenicol (Chloromycetin®) and nitrofurantoin (Furadantin®) were administered. On the ninth postoperative day she was discharged in good condition with minimal vaginal discharge which subsided approximately six weeks later.

The patient was admitted again ninety-three days following abdominal surgery because of recurrent fever and purulent discharge from the vaginal vault. Ten days prior to this admission the patient's temperature rose to 101°F. and then subsided when a large amount of purulent discharge drained from the vagina.

She was taken to the operating room December 19, 1959, and under general anesthesia, pelvic examination revealed a mass measuring approximately 8 cm. in diameter. A sinus tract to the pelvic exudate was probed and enlarged and a ¼ inch drain was inserted. Cultures showed Proteus mirabilis and Escherichia coli. The patient was discharged from the hospital on the second day; however she returned ten days later complaining of abdominal pain. A tubo-ovarian abscess, which

could not be treated adequately via the vagina, was diagnosed and laparotomy was decided. Prior to operation a Foley catheter was placed in the pelvic sinus tract that opened into the vaginal vault. The peritoneal cavity was then entered from above and an 8 cm. mass arising from the left tube and ovary was noted and found to contain the Foley bag. The mass, covered by a purulent exudate, was adherent to the sigmoid colon and to the lateral pelvic wall. It was freed by sharp and dull dissection and excised. Although the right adnexa was entirely normal, it was excised also. Penrose drains from the operative site through the vagina were placed and left *in situ* for approximately seventy-two hours. Examination of the excised tissue showed abscess in the left tube and ovary and normal right tube and ovary. A culture revealed Pr. mirabilis and Escherichia freundii.

Postoperatively the patient received chloramphenicol orally and showed no unusual morbidity. She was discharged in good condition on the eighth postoperative day and a five month follow-up revealed her to be asymptomatic and well.

CASE II. P. W., a thirty-eight year old woman (para 1-0-0-1), had a total abdominal hysterectomy on June 15, 1959, for multiple myomata at the Long Island Jewish Hospital. At the time of surgery the tubes and ovaries were inspected, found to be grossly normal and were retained. Her postoperative course was without complications and she was discharged on the ninth postoperative day.

She was readmitted September 27, 1959, 103 days following initial surgery, because of sudden onset of pain in the lower right side of the abdomen. Her temperature was 102°F. and her pulse was 92 per minute and regular. Abdominal examination revealed slight distention with direct and rebound tenderness in the right lower quadrant. Pelvic examination showed a soft fixed tender mass, 7 cm. in diameter, in the cul-de-sac.

With a preoperative diagnosis of torsion of an ovarian cyst or acute appendicitis, the patient was taken to the operating room for laparotomy. On entry into the peritoneal cavity, edematous and inflamed tubes and ovaries were agglutinated in the midline. These structures were freed by sharp and dull dissection and excised. The appendix, which was incorporated in the mass, was also removed. Examination of the excised organs showed chronic perisalpingitis and perioophoritis with multinucleated foreign body giant cell reaction and mild periappendicitis. There was no postoperative morbidity and the patient was discharged on the ninth day.

COMMENTS

The surgical removal of ovaries is associated with an increased incidence of atherosclerosis, hypertension, osteoporosis, arthritic changes and disturbances of the psyche [*5,6,9,11,14, 21,22,26*].

The ovary maintains an estrogen level in the postmenopausal woman that is significantly higher than in the castrate [*12,15,18,19*]. Premenopausal and postmenopausal ovarian function is not altered by hysterectomy [*1,25*]. All these considerations are potent reasons for conservation of ovarian tissue and would seem to warrant the slight hazard of neoplasm or cystic change developing in the retained ovary [*3,16,17*].

In both cases presented herein, a modified Richardson technic was used [*20*]. The fallopian tube stumps were inverted into the space made by the closed parietal peritoneum overlying the operative site above and the closed vaginal vault below. An area is thus created which is devoid of proper drainage and adequate vascular supply. That this area is predisposed to infection is apparent for the vault infection is not an uncommon complication following hysterectomy [*13*].

Cutting and ligating the fallopian tube and utero-ovarian ligament results in local venous congestion. Studies by Delson [*2*], using liquid casts, have demonstrated the spiral arteries of the ovary and their uncoiling due to pressure created by adjacent venous engorgement. The spiraling of these vessels acts to reduce the systemic blood pressure in the distal portions of the ovary. As a result of the uncoiling of these vessels, an increased blood pressure is transmitted to the capillary level causing an extravascular transudate. This transudate, if present, could predispose to varying degrees of infection in the ovary; and indeed in an available series of thirty residual ovaries, seventeen showed incidental microscopic evidence of oophoritis [*8*].

In the first case, organisms cultured from the fistulous tract, connecting the tubo-ovarian abscess to the vaginal vault, were similar to those cultured from the patient's urine in the immediate postoperative period three months earlier when the patient exhibited symptoms suggestive of a lower pelvic peritonitis.

Contamination of the operative site could have occurred at the time of surgery, although spread there may have been due to direct extension of organisms from the vagina. Hematogenous spread from the infected urinary tract is another possibility.

Tubo-ovarian infection usually occurs bilaterally. Our patient showed unilateral involvement. Some local factor predisposed it. This factor may be more marked vascular obstruction and congestion on one side as compared to the other. The patient received chloramphenicol therapy for five days. The culture of similar organisms from subsequent infection suggests incomplete antibiotic therapy because of inadequate total dosage or poor tissue profusion due to the vascular impairment.

Our second case was that of a perisalpingo-oophoritis with an associated periappendicitis and pelvic peritonitis. The pathogenesis in this instance is hard to postulate, but it is not inconceivable that the predisposed operative site was innoculated at surgery and remained subclinical until the acute episode three months later.

It would seem that many cases of postoperative vault infection have an associated salpingo-oophoritis that goes unrecognized and responds completely to antibiotics and drainage. Both our cases occurred during a period of hospital infection, and perhaps the critical factor in each was the pathogenicity and virulence of the bacterial organisms.

Inflammatory change in retained adnexae should be included in the differential diagnosis of pain in the lower portion of the abdomen of any patient who has undergone hysterectomy with ovarian conservation. If the clinical picture in any way simulates acute appendicitis, immediate surgery is indicated. Cases characterized by a pelvic mass are best treated conservatively with antibiotics, bed rest, local heat, and drainage from below. If there is no clinical response to these measures, then laparotomy is indicated. At surgery all tubo-ovarian tissue should be removed, for ovarian conservation has no place when this situation has been reached.

Prophylaxis involves meticulous technic in handling the retained adnexae when the hysterectomy is performed. Reperitonealization, without the bunching of tissue or the alteration in the position of the ovary, necessitates small approximation sutures to close the parietal peritoneum in the lateral angles. The dead space created between the closed parietal peritoneum at the operative site and the closed vaginal vault should be obliterated as completely as possible.

Since the patient with retained ovaries is prone to complications which can simulate acute appendicitis, prophylactic appendectomy may have its place in those cases that are uncomplicated by adhesions or technical considerations.

CONCLUSION

The gynecologist is faced with the judicious management of adjacent ovarian tissue at the time of hysterectomy for benign uterine disease. Evidence emphasizing the metabolic role of the premenopausal and postmenopausal ovary favors ovarian conservation at the time of surgery. Such a course leaves the patient prone to subsequent surgical complications in the retained adnexae. Attention is called to complications distinctive to the posthysterectomy state. Two cases in which inflammatory change necessitated repeat pelvic surgery are presented. This type of complication is offered as another risk associated with ovarian conservation along with neoplasm and cystic change.

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Cancer of the Thyroid Gland

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So many unorthodox statements regarding cancer of the thyroid gland have been made in recent years that the profession seems confused. The impression has been created that cancer of the thyroid does not behave in a malignant manner and the tendency has been to curtail operative procedures. The author wholeheartedly disagrees with these concepts and urges a return to adequate use of surgery. This combined with a careful follow-up using I^{131} in all cases, will give the patient the best possible chance of survival.

These conclusions are based on a personal experience with seventy-seven cases of cancer of the thyroid gland and observation of many patients operated on by other surgeons. Thirteen of our patients have died of cancer and another is doomed to die soon because of recurrence. This type of cancer is definitely malignant and will kill, regardless of its histology. A return to the fundamental principles of cancer surgery, as outlined by Halstead, is imperative. In addition the purpose of this paper is to describe and illustrate the surgical technics used in an extended operation for removal of the esophageal chain of lymph nodes down under the sternum. The requisites of block resection of the neck are also considered.

Adenomas play a predominant role in the production of cancer. Therefore, when such a condition presents itself, it should be regarded seriously. There is no clinical method by which the presence of malignancy can be ruled out. It has been our policy to operate on all patients presented to us and this has yielded a 6 per cent cancer rate. The mortality rate for such surgery is no contraindication since we have had no deaths in the last 1,000 cases. The removal of benign adenomas is not only prophylactic but is satisfying to the patient. "Watching" these is unrealistic and certainly will not cure and, should malignancy be present, the behavior is entirely unpredictable. We have seen rapid growth of the cancer and death in every pathologic variety.

Clinically, it is impossible to determine the presence or absence of metastases to the lymph nodes in the neck. When nodes are palpable, they may be "hyperplastic" and often metastases are present in glands which cannot be palpated.

Since most forms of cancer of the thyroid are not susceptible to radiation, the primary surgery should be sufficiently extensive to eradicate all cancer in the neck as adequately as possible. Removal of only one lobe, followed by a token dose of radiation, is not adequate treatment and is entirely unfair to the patient. This method should be condemned. We have seen several such cases with recurrences in the other lobe and lymph nodes which could possibly have been prevented by adequate surgery and I^{131} follow-up. Where a lobectomy, only, is performed, the value of I^{131} is very limited. The radioactive iodine is absorbed by the remaining lobe and may not be taken up by the metastases. However, if total thyroidectomy is performed and, in addition, stimulating doses of T.S.H. (thyroid stimulating hormone) are used, the uptake in the metastases has increased to 70 per cent. In cases of doubt a larger dose of I^{131} will often give a more conclusive thyrogram and will demonstrate lesions which could not be shown by the smaller dose.

The thyroid gland is a soft, spongy, vascular

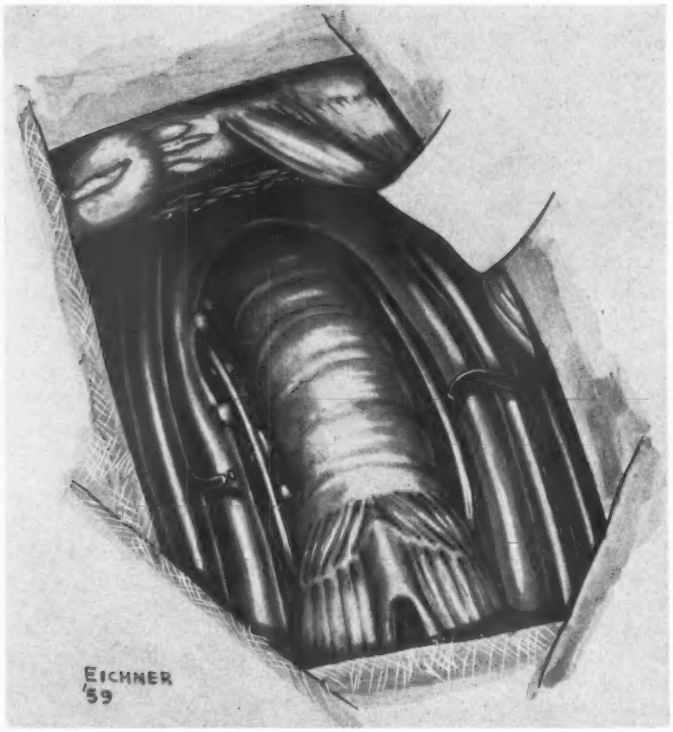

FIG. 1. A view of the esophageal and substernal dissection. When the origins of the sternomastoid and strap muscles are divided, dissection down to the arch of the aorta may be accomplished under direct vision. It is surprising that this can be done with ease and safety to the recurrent nerves.

organ in which the spread of cancer readily occurs. Multicentric areas of cancer are frequent and cancer was found in both lobes in over 25 per cent of our cases. If more extensive sections were routinely made, this figure would be much higher. If the cancer is in the isthmus, it should be presumed to have invaded both lateral lobes. The above facts again emphasize that lobectomy is an inadequate surgical procedure. No cancer patient should be denied the benefit of adequate surgery and radioactive iodine follow-up regardless of histologic findings. Nearly always the tumor is of a mixed type with an element of acinar or follicular formations. After total thyroidectomy and the administration of stimulating doses of hormone, the character of metastases changes and the uptake of I^{131} increases markedly. Under these circumstances the uptake in metastases rises to 70 per cent. This assists materially in discovery and treatment.

OPERATIVE PROCEDURES

When we operate for adenomas, a total lobectomy is always performed. A subtotal resection may leave other adenomas or a multicentric area of cancer. It may even cut through a malignant area and cancer cells may be spread. Local lymph nodes are also removed for biopsy. The mass is sent to the pathologist. If the report is negative for cancer, inspection of the contralateral lobe is made. It has been our experience that we rarely find a single adenoma. Frequently, the other lobe contains adenomas and should also be removed. We believe that a total thyroidectomy does not carry with it any serious morbidity. Myxedema is not to be feared, since perfect replacement

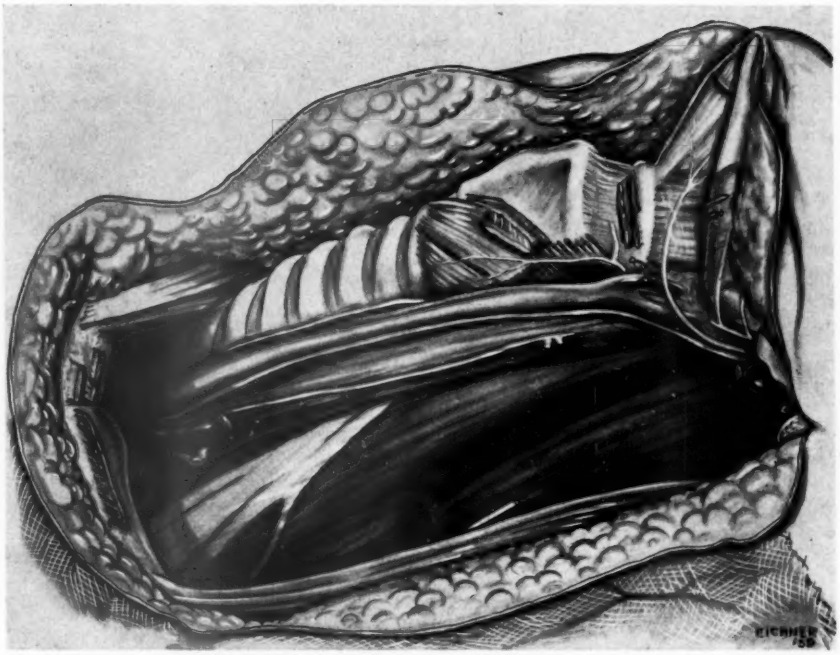

FIG. 2. Our conception of a complete and adequate resection of the neck. Again the substernal area is visualized. The left recurrent nerve runs in the groove between the trachea and esophagus. The vagus and phrenic nerves are shown. The jugular vein is ligated high to prevent damage to the thoracic duct which appears on its lateral and posterior sides. The superior thyroid artery is ligated but the plica or fold containing the superior laryngeal nerve is seen. It is important not to cut this fold since the nerve would then be severed. Both bellies of the digastric muscle as well as the mylohyoid have been removed. Lying on the hyoglossus muscle is the hypoglossal nerve. Branches of the mandibular branch of the facial nerve are seen passing over the angle of the jaw. These are carefully preserved. We now remove the upper end of the sternomastoid muscle entirely and do not leave a stump. The cut end of the spinal accessory nerve is shown near the trapezius muscle.

can be obtained and maintained with adequate doses of thyroid extract. In our hands there has been very little added difficulty with parathyroid deficiency or recurrent laryngeal nerve paralysis.

A subtotal thyroidectomy for adenomas is to be condemned since recurrence of the adenomas often takes place and secondary operations are necessary. At least four cases in our series showed malignancy occurring in the remaining lobe where a lobectomy only had been performed, sometimes years previously. We occasionally perform lobectomy only but usually feel guilty in doing so.

If the pathologist is able to diagnose carcinoma definitely by the quick frozen sections, we proceed to perform total thyroidectomy and block resection of the neck together with the esophageal and substernal dissections.

When the pathologist is unable to state definitely that cancer is present by the quick frozen methods, we close the neck and await the verdict of the paraffin slides. If these reveal cancer, the patient is brought to surgery again at which time a total thyroidectomy and the other extended operations are performed. Again we emphasize that a lobectomy is entirely inadequate surgery. The parathyroids are often sacrificed on the side of the cancer but are usually saved on the other side.

Esophageal Node and Substernal Dissection. Complete thyroidectomy is accomplished as thoroughly as possible. The esophageal chain of lymph nodes and those under the sternum are

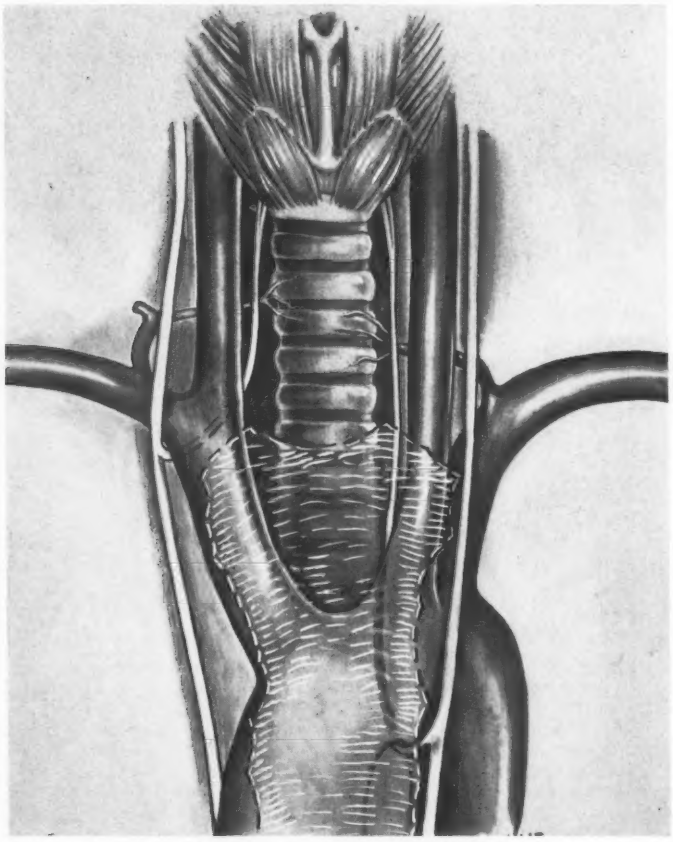

FIG. 3. Illustration of how the vagus nerve passes down lateral to the carotid arteries. The recurrent nerve on the left side passes up behind the arch of the aorta while it winds upward and inward behind the subclavian artery on the right side. Dissection on the anterior surface of the carotid arteries and the innominate may, therefore, be performed without danger to the recurrent nerves.

now removed by the technic illustrated. (Figs. 1 and 2.) The fascia is stripped from the surface of the carotid arteries and this dissection is continued down under the sternum until the upper surface of the arch of the aorta is visualized. The innominate artery on the right side is similarly cleared. On reaching the aorta, the tissues just above this point are clamped, divided and ligated since they may contain some vessels. The above procedure is perfectly safe and easily accomplished since the recurrent nerves are posterior and medial to these large blood vessels. (Fig. 3.) The areolar tissue bearing lymph nodes is dissected upward, beginning at the arch of the aorta. When the recurrent nerves come into view, they are carefully protected. These nerves may be cleared with ease and safety. The tissue deep to the nerve must also be removed.

Block Resection of the Neck. This procedure is almost routine in our experience. The following points should be emphasized. (Fig. 1.)

The sternomastoid is removed entirely, up to and including its attachment to the mastoid process. We now have a case with recurrent carcinoma under a stump of sternomastoid muscle near the mastoid process. The strap muscles are also removed. In several instances

positive lymph nodes were discovered lying between these muscles.

A suprahyoid dissection is necessary since in many cases the glands are positive for metastases right up to the base of the skull along the jugular vein. Both bellies of the digastric muscle are removed as well as the mylohyoid.

In stripping upward along the carotid artery, a plica, or fold of tissue may be felt with the finger, passing from the carotid artery medially to the thyroid cartilage. (Fig. 2.) This fold contains the superior thyroid artery and the superior laryngeal nerve. In the surgeon's enthusiasm for a "clean dissection" it is tempting to divide this plica. This of course would result in serious complications since this nerve supplies the sensory fibers to the interior of the larynx.

To avoid injury to the thoracic duct it is important to divide the jugular vein at least two inches up in the neck.

COMMENTS

Since cancer involves both lobes in at least 25 per cent of cases, it should be obvious that a "lobectomy" is inadequate surgery.

There is no logical reason for not also performing a block resection, at least on the same side as the primary lesion. This need is particularly emphasized since positive lymph nodes are found in over 67 per cent of cases so explored. The morbidity and cosmetic deformity are a small price to pay for a thorough type of operative procedure. A block resection which does not include a paraesophageal lymph node dissection as previously described is inadequate since these local nodes are often the only ones involved in metastases.

In pretty young girls, when we are reasonably confident that metastases are not widespread, we sometimes enlarge the incision so that exploration of the posterior triangle and the jugular chain may be made. In a few such cases we have preserved the sternomastoid. In a few other cases we have been content with a complete thyroidectomy including the regional (esophageal and substernal) lymph gland dissection. It should again be emphasized that the minimum operation which should be performed is complete thyroidectomy and block resection plus esophageal and substernal dissection.

When large masses occur in the superior mediastinum, it is logical to split the sternum for their adequate removal. Our personal experience with this procedure is limited. Its use is urged when indicated since many of these cases are definitely operable with hope of cure.

Secondary operations for recurrences in the neck are feasible if they are movable and not infiltrating. Palliative procedures also are often worth while. Clearing the trachea and performing a tracheostomy often prolong life in a creditable manner.

No case should be denied a thorough follow-up with radioactive iodine. Any residual uptake in the neck should be ablated by appropriate doses of I^{131}. Any recurrence of uptake areas are usually readily erased by therapeutic doses of I^{131}. If these are neglected, they may change their character over a period of time and no longer take up iodine. Whether or not metastases will occur from metastatic lymph nodes in the neck is difficult to prove. We are convinced that keeping any "uptake" areas ablated from the neck will reduce the incidence of distant metastases. Certainly it seems very irrational to leave known cancer in the neck since its behavior is entirely unpredictable.

In our personal series of seventy-seven cases of cancer of the thyroid gland, which cover the past twenty years, there have been thirteen deaths from the disease and two deaths from other causes. Of the thirteen there were eleven patients who survived less than seven months. Of these eleven cases only five were anaplastic in type; three were Hürthle cell; two were follicular and alveolar; and three were papillary or mixed types of papillary and alveolar. It is very evident that any type of carcinoma can invade and kill the patient in a few months. These cancers therefore should all be treated radically regardless of histologic findings.

When the patients with hopeless cancer and those dying of other causes are deducted from our series, only two deaths occurred in patients who may be classified as having had a chance for survival. These patients had lived for over ten years following their operations. This is approximately 3 per cent. These results encourage us to continue our present policy. It is recognized that a larger number of similar series will be desirable. We are quite emphatic in stating that cancer will kill and therefore deserves to be fought with everything at our command. We are convinced that adequate surgical procedures with the minimum operation being

total thyroidectomy and a careful follow-up using radioactive iodine will yield the most favorable results.

SUMMARY

A personal series of seventy-seven cases of cancer of the thyroid gland is presented.

An urgent plea is made for adequate surgical procedures and a painstaking follow-up with I^{131}.

The surgical technic used by the author for esophageal chain and substernal dissection is illustrated and described. The author's block resection is shown in a suitable drawing. (Fig. 2).

Repair of Femoral Hernia by the Henry Approach

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IN the main there have been two avenues of approach to the surgical treatment of femoral hernia, the inguinal or high approach and the low or femoral approach. The anterior, low midline extraperitoneal approach as described by Henry [1] is a third method which gives excellent unilateral or bilateral exposure to the femoral canals and adjacent structures as well as free access to the peritoneal cavity for bowel examination and/or necessary definitive surgery.

Despite the common use of the femoral and inguinal procedures they can be considered anatomically inadequate in some respects. In the femoral procedure it is often difficult or impossible to approximate the shelving edge of Poupart's ligament to Cooper's ligament since adequate exposure of the femoral ring is usually not satisfactory; therefore, in most cases the inguinal ligament is sutured to the pectineus fascia. The latter structure often lacks sufficient strength to provide a satisfactory repair.

The presence of an anomalous obturator artery over the neck of the sac can make the femoral approach a hazardous procedure. The vessel originates from the external iliac or inferior epigastric artery and is present in about 20 to 30 per cent of cases [2]. If the vessel should be damaged or torn in this critical position, it might be most difficult to retrieve and treat statisfactorily.

The inguinal approach, while considered more favorably since it gives sufficient space for the repair of any variety of femoral hernia, has the disadvantage of disrupting the intact inguinal structures and inguinal hernias have been reported following this procedure [3].

Of much more importance is the fact that in either the inguinal or femoral approach there frequently is difficulty in assessing the viability of the involved segment of bowel or its segment of mesentery. If bowel resection is considered necessary, the exposure afforded is not adequate for safe bowel resection. This point becomes even more significant when one considers the fact that approximately 25 to 40 per cent of femoral hernias are incarcerated or strangulated [4].

With neither of the above methods of approach can a high ligation of the hernial sac be accomplished since a peritoneal dimple is left behind which may act as a focus for recurrent herniation. Again, since approximately 20 per cent of cases present bilateral lesions [5], neither the femoral nor the inguinal approach would be a satisfactory procedure for complete cure in those cases. The Henry approach gives excellent bilateral exposure to the femoral canals through the single incision.

TECHNIC

With the patient in the Trendelenburg position a low midline incision is made. The rectus muscles are separated from one another and from the underlying peritoneum and bladder by gentle hand dissection. With the assistant retracting the rectus muscle and the surgeon's hand depressing the peritoneum and contents, the hernial sac and vessels are immediately visible. (Fig. 1.) If an anomalous obturator artery is present, it is ligated. The sac of incarcerated tissue in the hernia is released by incising the lacunar ligament. (Fig. 2.) If the incarcerated content is too large to permit reduction through the femoral canal, the inguinal ligament can be divided. Subsequently the inguinal ligament can be resutured before completing the hernial repair. The femoral canal is then closed by suturing the inguinal

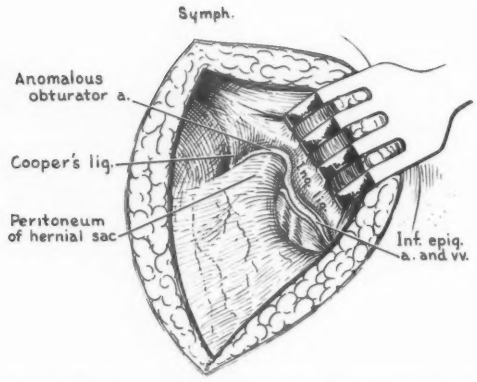

FIG. 1. Diagrammatic representation of structures after rectus muscle is retracted.

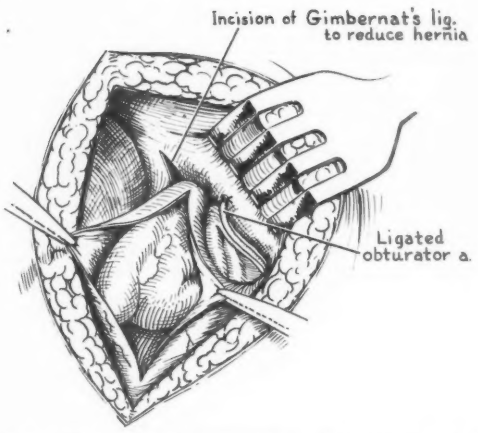

FIG. 2. Diagrammatic representation of opened hernial sac.

ligament to Cooper's ligament with non-absorbable sutures. (Fig. 3.) If this is not possible, a flap of pectineus fascia can be raised to close the defect (Henry). The iliac vein is under direct vision so that the repair of the canal can be made in comfort.

Following the repair of the femoral canal the hernia sac is opened for inspection as to the viability of the contained tissue. If further surgery is indicated, the peritoneum is opened as widely as desired and the necessary operation performed; if not, the dissected sac is excised and the peritoneum closed. The opposite side is inspected if necessary. If a canal exists or if another hernia is present, a similar repair is made. The midline wound is then closed in layers and in the routine manner.

CASE REPORTS

The above technic has been used in the following three case reports:

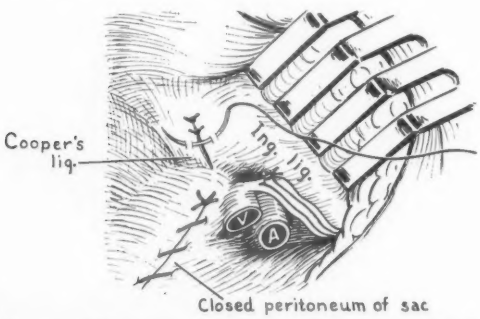

FIG. 3. Diagrammatic representation of completed procedure.

CASE I. L. P., a forty-nine year old obese white woman, was admitted to St. Vincent's Hospital on October 30, 1957 with fibromyomas of the uterus and a recurrent right reducible femoral hernia. She had had a repair of the hernia on two separate occasions in the past ten years.

Operation was performed the day following admission. A low midline incision was made, the abdomen opened and a total hysterectomy performed. A femoral hernia was demonstrated on the right side while the abdomen was opened. The peritoneum was then closed and the right femoral area was exposed extraperitoneally. The hernial opening was demonstrated with ease and repaired with three interrupted silk sutures after the hernial sac had been excised. In the repair the inguinal ligament was sutured to Cooper's ligament with complete obliteration of the femoral canal. The postoperative course was uneventful. The patient was discharged on the fifteenth postoperative day with the wound well healed. There has been no recurrence of the hernia to date.

CASE II. J. O., a seventy-two year old white woman, was admitted to St. Vincent's Hospital on December 21, 1957 with an incarcerated umbilical hernia, a strangulated right femoral hernia and an acute intestinal obstruction. After the patient had been adequately prepared with infusions and intubation, she was operated upon through a low midline incision. The incision was carried down to the peritoneum and the right femoral area exposed. The peritoneum above the neck of the sac was immediately opened since reduction of the contents of the hernia was not possible. A gangrenous loop of jejunum was found which required an intestinal resection. An end to end anastomosis was then performed. After this

the edematous hernial sac was removed from the femoral canal and repair of the canal was accomplished by suturing the inguinal ligament to Cooper's ligament with interrupted silk sutures. The contents of the umbilical hernia were reduced into the abdomen through the incision in the lower peritoneum and the umbilical hernia repaired from within the abdomen. The peritoneum and the remaining abdominal wall were then closed in layers. The patient made an uneventful recovery and was discharged on the fifteenth postoperative day with her wound well healed. There has been no recurrence to date.

CASE III. M. I., a sixty-one year old white obese woman, was admitted to St. Vincent's Hospital on October 21, 1958 with a large reducible left femoral hernia.

Operation was performed the day after admission through a low midline incision utilizing the Henry approach. The hernial sac was easily identified and reduced. The femoral canal was obliterated with interrupted silk sutures by approximating Cooper's ligament to the inguinal ligament. The hernial sac was then opened and excised and the neck of the sac closed with a transfixion suture of silk. The abdominal wall was closed in layers. The patient made an uneventful recovery and was discharged on the tenth postoperative day with the wound completely healed. There has been no recurrence to date.

COMMENTS

The recurrence rate for femoral hernia averages about 4 to 6 per cent with the usual methods of repair [6]. The anatomic and clinical features which have been presented reveal some of the disadvantages of the surgical procedures ordinarily used. Any other method which provides the surgeon with the advantage of a more facile exposure and satisfies the basic surgical principle for herniorrhaphy such as high ligation of the sac and accurate and safe apposition of supporting ligaments for obliteration of the hernial defect should have serious consideration as to the surgical technic one might use.

The Henry approach allows an excellent and easy approach to unilateral or bilateral femoral hernias through one incision and the elective repair of the femoral hernia can be effected in conjunction with other abdominal and pelvic procedures as illustrated in Cases I and II. Although the procedure has not been recommended in obese patients, it was done on two very obese women (Cases I and III) without difficulty.

SUMMARY

1. The Henry technic and its advantages are discussed.

2. Three cases of femoral hernia are presented which were repaired by means of this approach.

3. Obesity does not appear to be a contraindication for the use of the procedure.

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CASE ANALYSIS CLINIC

Cyst of the Lung

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PATIENT S. J. P., a five year old white girl, was admitted to the hospital because of a chronic cough. Since the age of nine months the patient had shown a tendency to frequent respiratory infections. A cough, productive of white sputum, started at three years of age along with weekly episodes of fever which occurred mostly in the early hours of the evening. Six weeks prior to admission, the sputum contained a streak of dark blood. Three cultures of the sputum for acid fast bacilli were negative. Up to two years of age, her growth and weight gain had been normal. From age two to four the rate of growth had diminished, and during the past year she had failed to grow. She had been treated with sulfa drugs intermittently because of chronic tonsillitis, and four months before admission a tonsillectomy was performed. Her appetite temporarily improved but her condition remained otherwise unchanged. Her first chest roentgenogram, taken three weeks before admission, demonstrated a large cystic cavity with a fluid level in the right base. She was admitted to the hospital for further investigation.

PHYSICAL EXAMINATION

The patient was a thin poorly nourished girl. She was in no acute respiratory distress but deep inspiration produced a rattling cough. Her temperature was 99.8°F., pulse 100 per minute, respirations 22 per minute and blood pressure 100/67 mm. Hg. Positive findings were limited to the right side of the lower portion of the chest where there was impairment of the percussion note with an overlying area of hyperresonance. There was no cyanosis or clubbing of the finger tips.

LABORATORY DATA

Roentgenographic examination of the chest confirmed the presence of the previously demonstrated cyst-like cavity. Hemoglobin was 13.1 gm. per cent and white blood count was 11,450 per cu. mm. (lymphocytes 51 per cent). The urine was alkaline with specific gravity of 1.018; there was no sugar or albumin present and microscopic examination showed no abnormalities. Blood urea nitrogen was 15.5 mg. per cent and fasting blood sugar 64 mg. per cent.

Nasopharynx and throat cultures for predominant organisms were obtained; no pathogenic organisms were isolated. The vital capacity was 544 ml. or 63 per cent of a predicted normal of 875 ml. The timed vital capacity was normal, indicating no obstruction to flow (the low value on the vital capacity was attributed largely to lack of patient cooperation). Skin tests for tuberculosis, with PPD No. 1, and for hystoplasmosis were negative. A bronchogram on the right showed good filling of the bronchial tree. There was evdience of a communication between the bronchial tree and the cyst. The neighboring bronchi were distorted and displaced by the cyst, which became well outlined by the oil. A film of the chest, obtained several hours later, showed a few drops of oil remaining in the cyst cavity. Because of the protracted course and symptomatology present, surgical treatment was decided upon.

SURGERY

The chest was entered on the right side through a posterolateral incision along the fifth

intercostal space. Thick vascular fibrous adhesions extended over the entire basal segment and most of the superior segment of the lower right lobe. The cardiophrenic angle was obliterated. Thirty ml. of foul-smelling purulent material was aspirated from the cyst and submitted for culture and sensitivity studies. Lobectomy of the right lower lobe was performed. The postoperative course was without complications. The resected specimen measured 11 by 7 by 2.5 cm. It contained a cyst measuring up to 6 cm. in diameter and was partially filled with mucoid material. There was induration of the lung parenchyma adjacent to the cyst. Several small bronchioles, measuring up to 2 mm. in diameter, were opening into the cyst. The wall of the cyst measured 4 mm. in thickness and was lined with respiratory epithelium infiltrated with inflammatory cells. The pathologic diagnosis was infected pulmonary cyst in the right lower lobe. Long term follow-up showed good recovery with weight gain and disappearance of the respiratory symptoms.

COMMENTS

Surgical intervention in children with lung cysts is a controversial point. There are three generally recognized* types of lung cysts which occur in infancy: the congenital lung cyst occurring in the newborn infant which often expands rapidly and requires emergency surgery; the postpneumonic pneumatoceles that seldom require surgery; and a third group for which surgery is occasionally indicated because of the chronicity of the symptoms and their deleterious effects on growth and development. The case presented herein belongs to the third group. The origin of these cysts is not clearly established. Generally there is no history of pneumonia. The severity of the symptoms will dictate the need for surgery. In the absence of symptoms, long term observation is indicated.

* RIKER, L. WILLIAM. Lung cysts and pneumothorax in infants and children. *S. Clin. North America*, 36: 1613, 1956.

Our Surgical Heritage

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UNITED STATES OF AMERICA

GEORGE McCLELLAN

GEORGE McCLELLAN, the founder of Jefferson Medical College in Philadelphia, was born at Woodstock, Connecticut on December 23, 1796. His father was the Head Master of the Woodstock Academy where McClellan received his early education. He received his Bachelor of Arts degree from Yale University in 1816. McClellan became the office pupil of Dr. Thomas Hubbard, who later became Professor of Surgery at the Medical College of New Haven. George McClellan, after one year with

Dr. Hubbard, moved to Philadelphia and became a pupil of John Syng Dorsey. He matriculated in the medical department of the University of Pennsylvania and was given the degree of M.D. in 1819. His graduating thesis was "Surgical Anatomy of Arteries." While a student, McClellan was a resident undergraduate in the Philadelphia Almshouse where he performed extensive dissections and did most of the capitol operations then known to surgery. George McClellan began to practice medicine in Philadelphia and became "a bold, talented surgeon."

In 1825, George McClellan made his much heralded and spectacular sixty mile ride on horseback from Philadelphia to Harrisburg where be obtained the charter from the state legislature for the founding of Jefferson Medical College. He was Professor of Surgery in Jefferson Medical College from 1826 until 1838 when the trustees for some unknown reason evicted all the professors from the institution. In 1839 he received a charter for the Medical Department of Pennsylvania College. This school was a success from the beginning; in it's first year there were one hundred students matriculated. The college was one of the fatalities of the American Civil War in 1860.

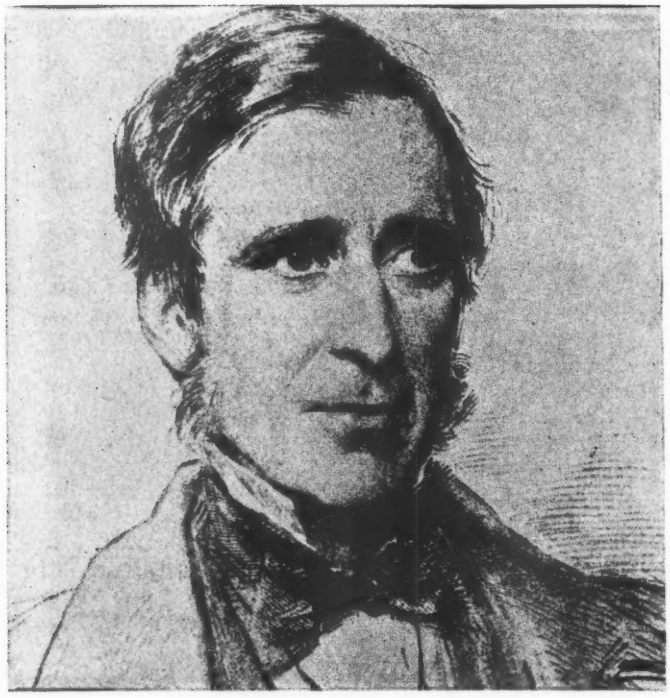
McClellan was one of the pioneers in the extirpation of the parotid gland. In 1830 he excised the scapula and the clavicle for malignancy, without the aid of anesthetic and without the use of arterial forceps.

He was fond of the good things of life including fine horses and racing. He died impoverished. "He bought town lots, built houses and lost money."

His death on May 8, 1847 was the result of an ulcerative perforation of the small intestine.

George McClellan deserves our admiration not only for his surgical skill and for the founding of Jefferson Medical College but also because he was the preceptor and teacher of the great Samuel David Gross.

EUROPE



JAMES PAGET

JAMES PAGET was the eighth child of Samuel and Sarah Paget. He was born in 1814 at Great Yarmouth, England.

Paget was a student at St. Bartholomew's Hospital and became a member of the Royal College of Surgeons of England in 1836 and a Fellow in 1843.

In 1861 Paget became a full surgeon and in 1875, President of the Royal College of Surgeons. In 1877 he delivered the Hunterian Oration and in 1882, the Bradshaw Lecture on "Rare Diseases." He received a baronetcy in 1871.

As a first year student (1835) of medicine at St. Bartholomew's Hospital he found small white specks in the muscles of his subject during a dissection. On examining this tissue with a microscope he saw a white worm surrounded by a capsule, which was named Trichina spiralis. This was the first trichinosis described in the human being.

In 1877 Paget was appointed Serjeant Surgeon to the Queen of England.

He had many friends in the literary world as Robert Browning, George Eliot, Ruskin and Tennyson; in the scientific world, Huxley, Darwin, Virchow and Pasteur; in religion, Cardinal Newman.

Two diseases received his name; eczema (malignant) of the nipple [Paget's disease of the nipple (1874)] and osteitis deformans [Paget's disease of the bone (1876)].

His two best known books are "Lectures on Tumours" published in 1851 and "Clinical Lectures and Essays" published in 1875.

Sir James Paget died at his home in Regents' Park, London, on December 30th, 1899. Services were held on January 4th in Westminster Abbey.

Paget was known for his brevity—he often said "To be brief was to be wise, to be epigrammatic was to be clever." Probably his most quoted saying was "as false as most proverbs."

The Diagnostic Corner

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A case demonstrating several interesting manifestations of trauma to the bony pelvis.

The Diagnostic Corner

THIS twenty-eight year old white man drove into a field at the end of a dead end road at a high rate of speed and was found unconscious on the ground at some distance from his wrecked automobile. When he arrived at the Emergency Room of the Ohio State University Hospital, he was unable to walk because of pain in both hip joints and in the lower portion of his abdomen. There was no evidence of a head injury, and the patient was normally responsive to questioning. There was no evidence of any intracranial pathologic process. Response to auscultation and percussion of the chest was normal. There was some tenderness to palpation in the lower part of the abdomen, and the patient guarded voluntarily when palpation was attempted. Any attempt to move his hips or flex his thighs caused pain. There was no evidence of fracture or dislocation of any of the extremities. Results of neurologic examination were normal.

Results of laboratory analyses were as follows: hemoglobin 13.2 gm., per cent, hematocrit 40 per cent, white blood cell count 10,250 per cu. mm. with a differential count including 23 per cent nonsegmented neutrophils, 69 per cent segmented neutrophils, 6 per cent lymphocytes and 2 per cent monocytes. The urine was grossly bloody. Roentgenograms of the chest were normal. An x-ray film of the pelvis was obtained and showed many interesting findings. *What is your diagnosis?*

Please turn page for answer

Diagnosis: Multiple traumatic lesions of the pelvis including fracture dislocation of the left acetabulum, arthrokatadysis of the right acetabulum, fracture of the right ischium and right pubis, dislocation of both sacroiliac joints, and separation of the symphysis pubis.

The Diagnostic Corner

It is surprising how many serious abnormalities can be seen in one x-ray film, as are demonstrated here. The marked width of the sacroiliac joints is obvious, particularly on the left side. The fracture of the pubis and the ischium can be seen easily. The comminuted fracture-dislocation of the left acetabulum is also apparent, the dislocation apparently being posterior to the acetabulum, inasmuch as there is no distortion of the head of the femur; dislocation of the femur anteriorly would cause the head of the left femur to appear much larger than that of the nondislocated right femur if the patient is in the supine position, as is the case in making x-ray films of the pelvis.

It is always a difficult decision in the case of multiple injuries to decide which injury to treat first. Ordinarily most orthopedic injuries do not require immediate definitive treatment if there are other serious injuries which should be treated first, such as head injuries, intra-abdominal hemorrhage due to laceration of the liver, spleen, etc., or traumatic perforations of intra-abdominal hollow viscera. However, fracture-dislocations usually require reduction of the dislocation as soon as possible in order to prevent severe vascular or nerve damage. Closed reduction of the dislocation of the left hip in the patient described herein was carried out immediately following unsuccessful preliminary traction, inasmuch as there were no other serious associated injuries involving other systems.

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Surgery Court Case

HOWARD NEWCOMB MORSE,* *Chicago, Illinois*

YBARRA VS. SPANGARD

Supreme Court of California

154 P. 2d 687

The patient consulted a physician who diagnosed his ailment as appendicitis and made arrangements for appendectomy to be performed by a surgeon. The patient entered the hospital, was given a hypodermic injection, slept and later was awakened and wheeled into the operating room by a nurse. The anesthetist adjusted the patient for the operation pulling his body to the head of the operating table and laying him back against two hard objects at the top of his shoulders about an inch below his neck. The anesthetic was then administered and the patient lost consciousness. When the patient awoke early the following morning, he was in his hospital room attended by a nurse.

Prior to the operation, the patient had never had any pain in or injury to his right arm or shoulder but, when he awakened, he felt a sharp pain about halfway between the neck and the point of the right shoulder. He complained to the nurse and then to the physician who gave him diathermy treatments while he remained in the hospital. The pain did not cease but spread to the lower part of his arm and after his release from the hospital the condition grew worse. He was unable to rotate or lift his arm and developed paralysis and atrophy of the muscles around the shoulder. He received further treatments from the physician and then wearing his arm in a splint on the advice of the surgeon, he returned to work.

The patient also consulted another physician who had x-ray pictures taken which showed an area of diminished sensation below the shoulder, atrophy and wasting away of the muscles around the shoulder. In the opinion of this physician the patient's condition was due to trauma or injury by pressure or strain applied between his right shoulder and neck. He was also examined by still another physician who expressed the opinion that the patient's injury was a paralysis of traumatic origin, not arising from pathologic causes and not systemic, and that the injury resulted in atrophy, loss of use and restriction of motion of the right arm and shoulder.

The patient brought an action in the Superior Court of Los Angeles County, California, against the operating surgeon to recover damages for injuries resulting from alleged malpractice. The court entered a judgment of nonsuit (dismissed the case) and the patient appealed.

The Supreme Court of California reversed the decision of the court below. The Supreme Court declared: "We have here . . . distinct injury to a healthy part of the body not . . . within the area covered by the operation . . . the doctor in charge of the operation would be liable for the negligence of those who became his temporary servants for the purpose of assisting in the operation. . . . In this connection, it should be noted that while the assisting physicians and nurses may be employed by the hospital, or engaged by the patient, they normally become the temporary servants or agents of the surgeon in charge while the operation is in progress, and liability may be imposed upon him for their negligent acts."

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